

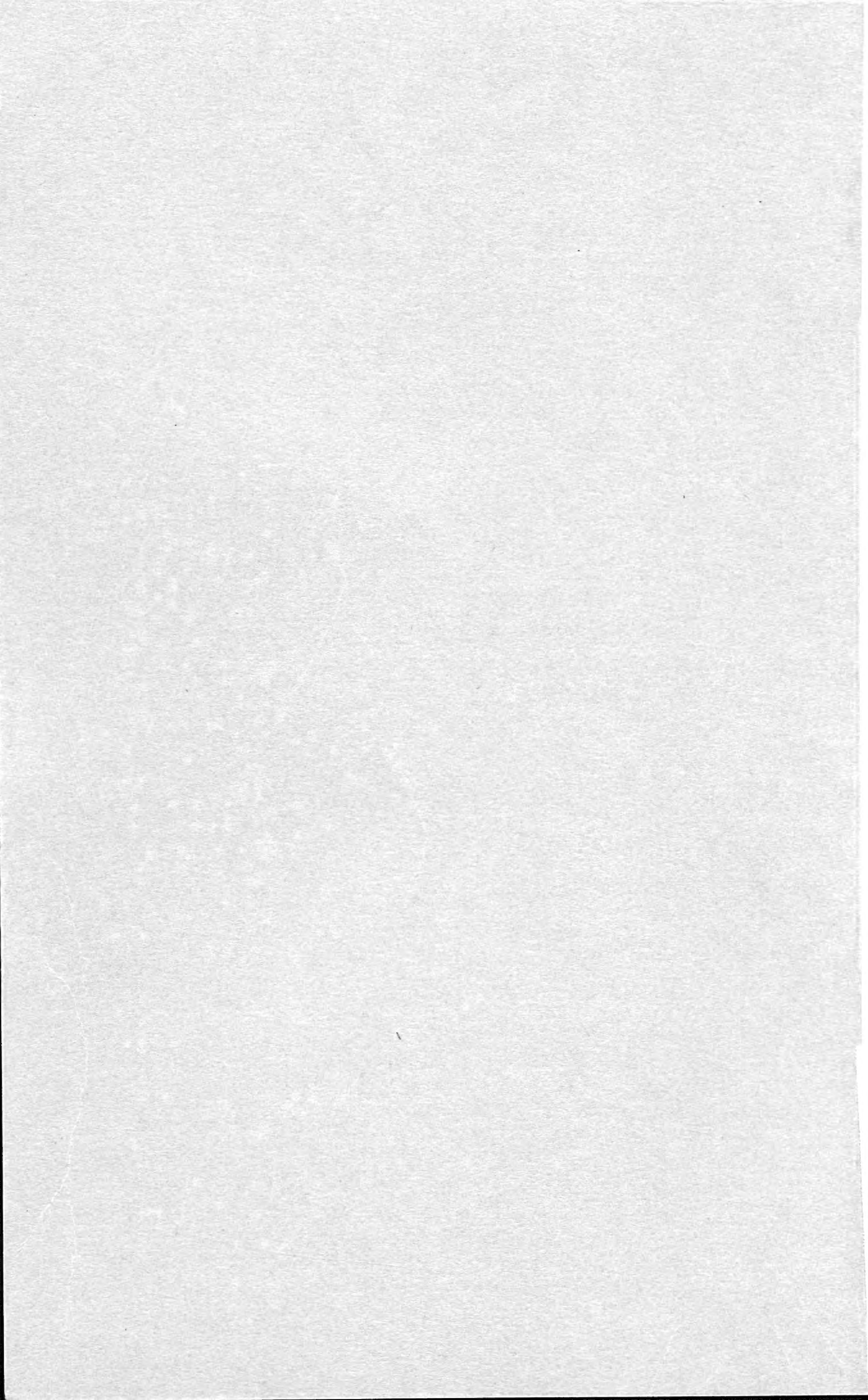
CANADA
DEPARTMENT OF RESOURCES AND DEVELOPMENT

NATIONAL MUSEUM OF CANADA
BULLETIN No. 126

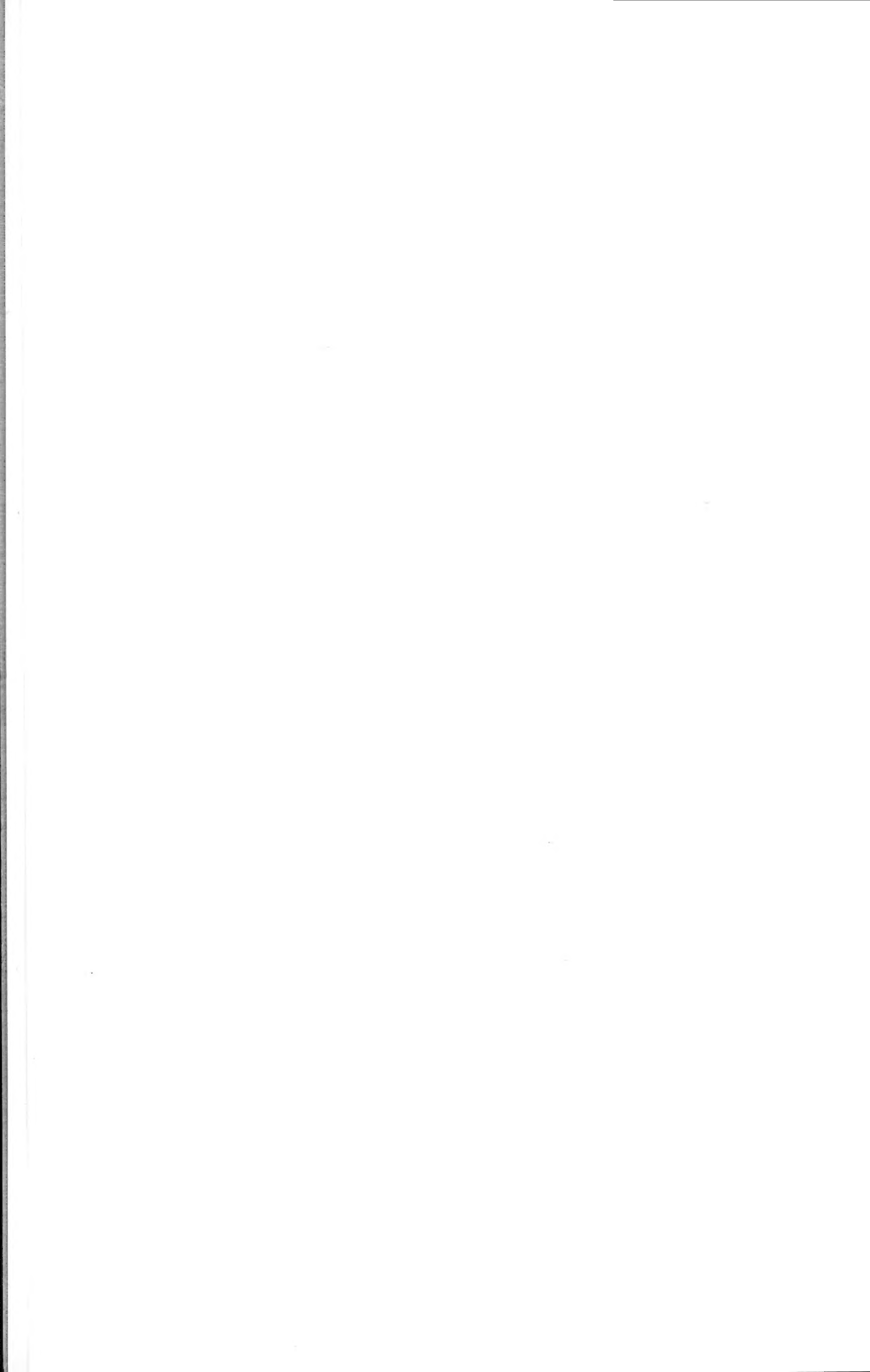
ANNUAL REPORT OF THE
NATIONAL MUSEUM OF CANADA
FOR THE FISCAL YEAR 1950-51

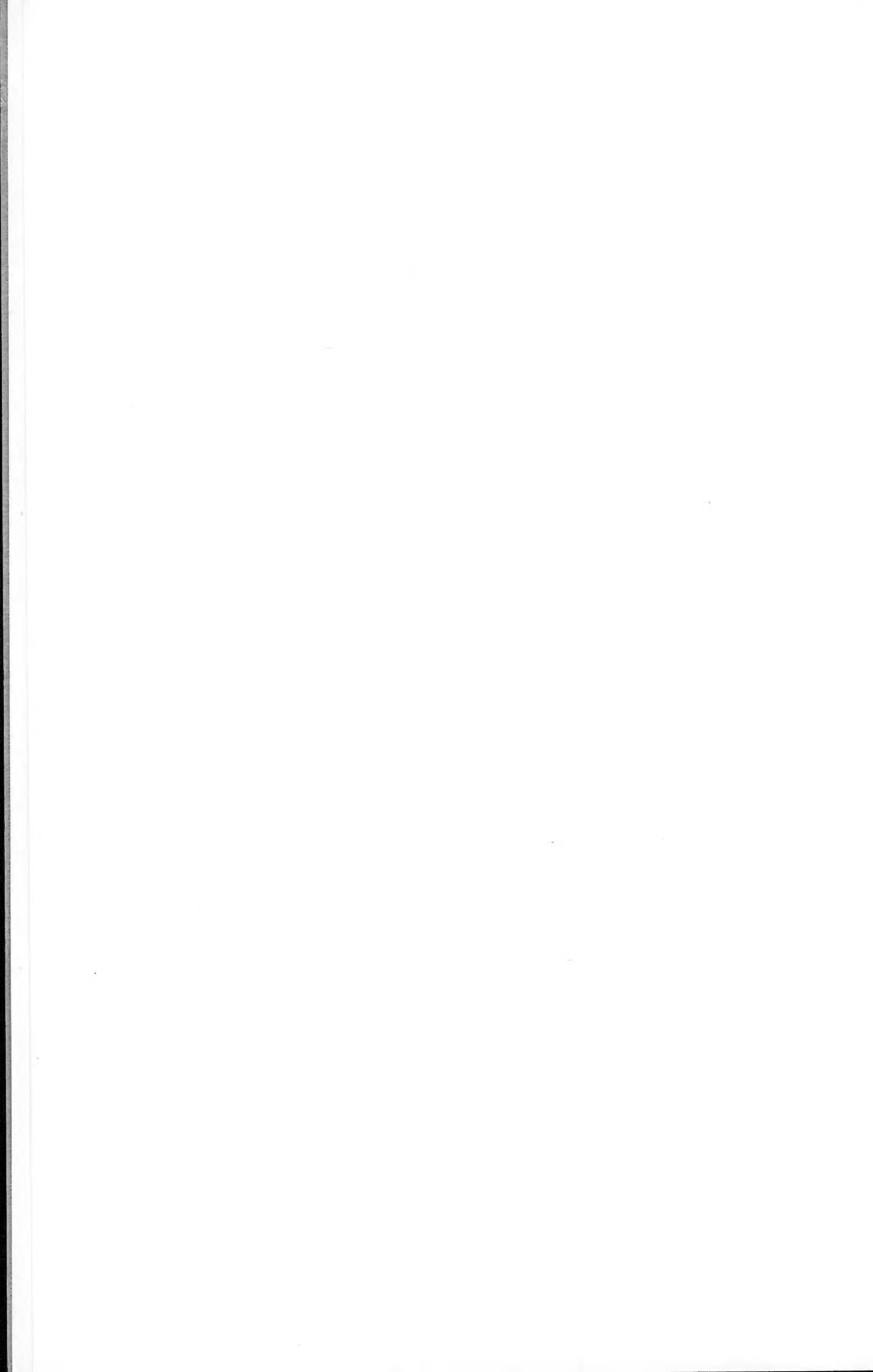
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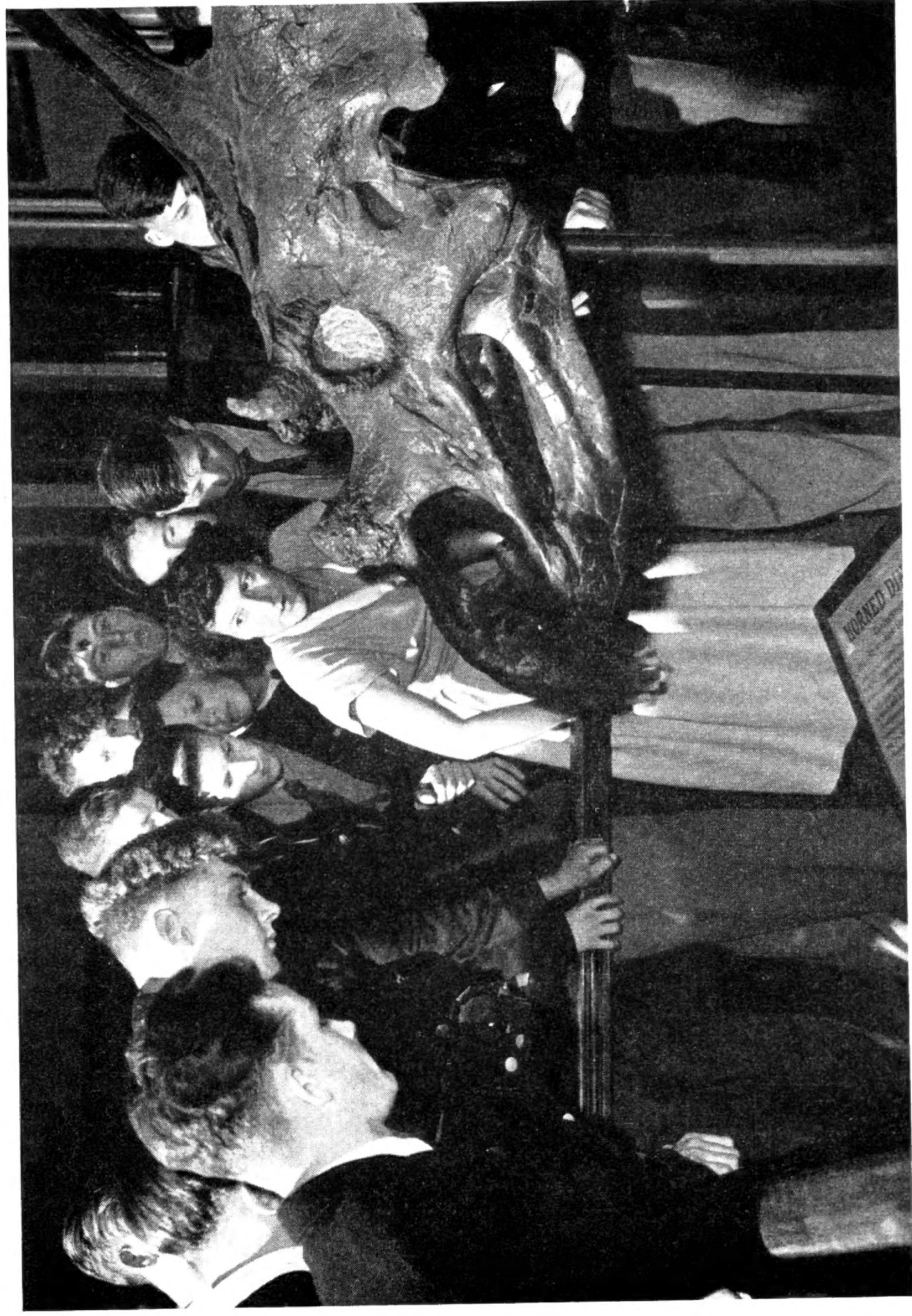
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Conducted tours are a feature of the educational work carried out by the National Museum.
(Photograph by Nott and Merrill)

CANADA

DEPARTMENT OF RESOURCES AND DEVELOPMENT

NATIONAL PARKS BRANCH

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NATIONAL MUSEUM OF CANADA

ANNUAL REPORT
OF
THE NATIONAL MUSEUM
OF CANADA

FOR THE FISCAL YEAR 1950-51

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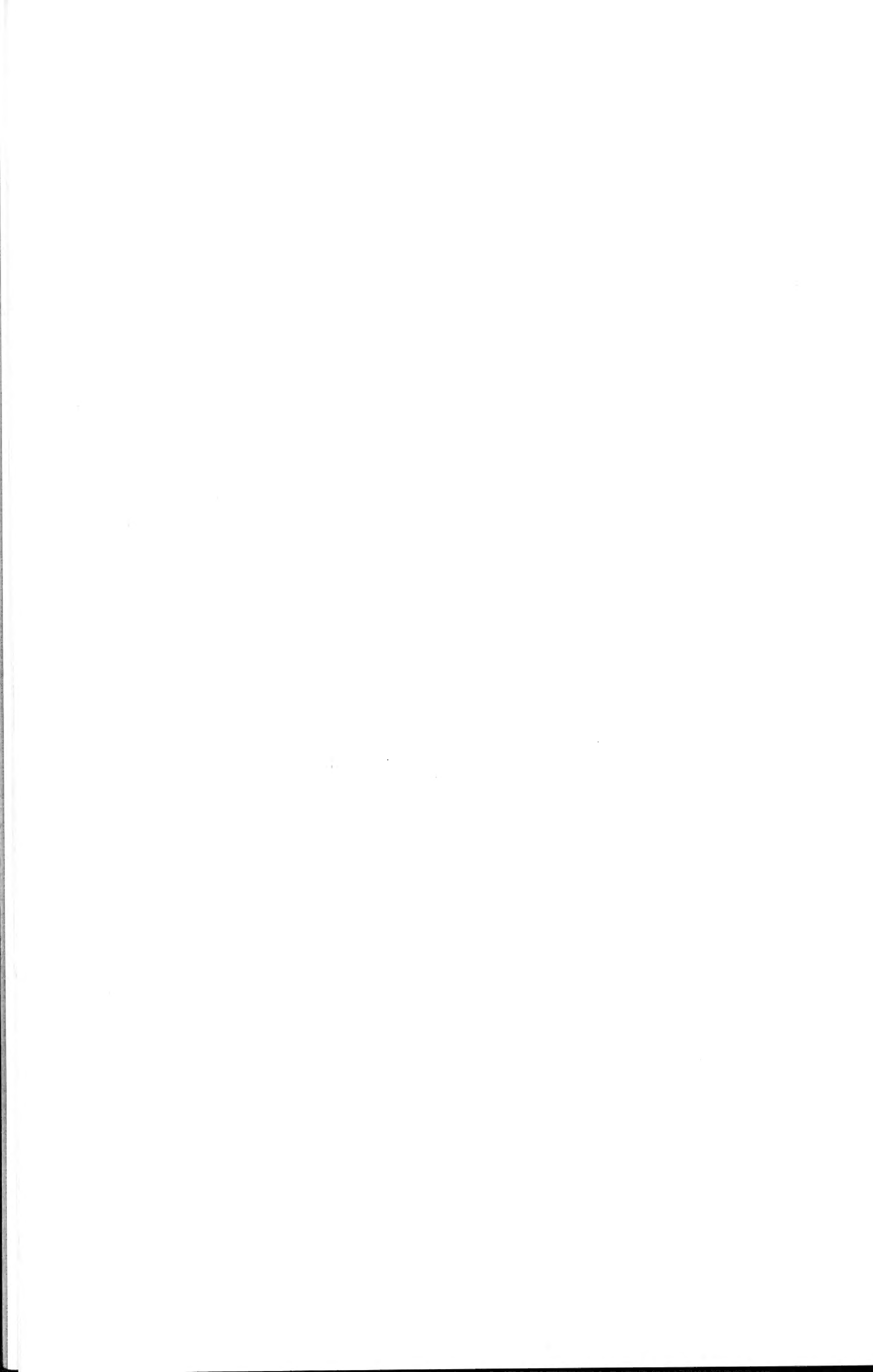
BULLETIN No. 126

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Issued under the authority of
THE MINISTER OF RESOURCES AND DEVELOPMENT

Ottawa, 1952

Price, \$1



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GENERAL ACTIVITIES OF THE NATIONAL MUSEUM OF CANADA

By F. J. Alcock, Chief Curator

In the Annual Report of the National Museum of Canada for 1949-50, it was stated that the succeeding year was expected to be one of considerable expansion for the Museum, as preparations were under way for the moving of the offices and laboratories of the Geological Survey from the National Museum building to permit opening up new exhibition halls and bringing to the Museum a great mass of material now stored elsewhere. These plans have not as yet materialized, and more space still remains our most pressing need.

The year, nevertheless, was one of activity and progress. A large amount of material was added to the Museum's collections by donations, purchase, and the work of field officers. Fourteen members of the Museum staff carried out field investigations during the summer months, and eight seasonal employees undertook work on special problems. The investigations covered a wide variety of subjects and took place in areas extending from Newfoundland in the east to British Columbia and the Yukon in the west, and from southern Ontario north to the Arctic. Botanical investigations were carried out in Manitoba; mammalogical studies were made in Newfoundland and ornithological ones in Alberta. Invertebrate zoological research was begun in the Maritime Provinces, and vertebrate palæontological work progressed in British Columbia, Alberta, Quebec, and Nova Scotia. Archæological work on Indian sites was performed in British Columbia, in both southern and northern Ontario, and in the Northwest Territories; the investigation of Eskimo sites on Cornwallis Island initiated in the summer of 1949 by Dr. Henry B. Collins, Jr., of the Smithsonian Institution of Washington, D.C., was continued. The collection and study of folk-lore and folk songs proceeded in Nova Scotia, Quebec, Newfoundland, and the Yukon.

Repairs on the National Museum building were carried out during the year. The auditorium was completely renovated; its entrances, staging, lighting, and ventilation improved and new drapes for the windows and stage put up. Additions were also made to the exhibits. In the Hall of Vertebrate Palæontology the skeleton of a dinosaur of the species *Leptoceratops gracilis* was installed; two paintings of Mesozoic reptiles and one of a mammoth prepared by P. R. Haldorsen were also added. In the Habitat Hall the mural over the wood buffalo group was completed, as well as three others in the same hall. The policy of having changeable exhibits, the so-called "Exhibit of the Month," was continued. One of the latter that attracted particular attention was that of a Grecian vase dating back to the fifth century B.C. belonging to the Prime Minister of Canada, the Right Honourable Louis St. Laurent. A special exhibit of paintings of Arctic flowers by Mrs. J. A. Woolgar of Yellowknife, N.W.T., also drew considerable interest. National Museum photographs, which had been selected for exhibition in London, England, of animal and plant life were placed on exhibit in the rotunda, as was also an Indian head-dress presented by the Brotherhood of North American Indians to the late William Lyon Mackenzie King while he was Prime Minister of Canada.

During the year, members of the Museum's staff delivered forty-five public lectures. In addition, there were autumn, winter, and spring series

of lectures for adults on Wednesday evenings, and similar series for children on Saturday mornings. Such lectures have been given for adults at the Museum since 1922, and for children since 1912. The auditorium was also used for lectures by scientific societies on many other occasions during the year. During the months of July and August, a film program arranged in conjunction with the National Film Board entitled "Canada in Colour" was put on every afternoon from 3 to 4 o'clock from Monday to Friday, inclusive, for the benefit of tourists and visitors. Another project carried out in conjunction with the Film Board was the production of a film strip on dinosaurs. The Macoun Field Club, composed of boys and girls interested in natural history, under the leadership of officers of the National Museum and of the Ottawa Field-Naturalists' Club, had an active year.

The following Museum Bulletins were issued and made available for distribution: Annual Report of the National Museum for 1948-49; Flora of Bic and the Gaspé Peninsula, Quebec, by H. J. Scoggan; Folklore of Waterloo County, Ontario, by W. J. Wintemberg; Folklore of Lunenburg County, Nova Scotia, by Helen Creighton; Birds of the Cypress Hills and Flotten Lake Regions, Saskatchewan, by W. Earl Godfrey; and Totem Poles, Volume 1, Totem Poles According to Crests and Topics, by Marius Barbeau. In addition, the Museum was responsible for the April-June number of the Journal of American Folklore, Volume 63, No. 248. This number was a Canadian one, the articles having all been prepared either by members of the anthropological staff of the National Museum or by persons who have been associated recently with the Museum. The articles were solicited, proofread, and arranged for publication by Marcel Rioux; the number was dedicated to Marius Barbeau, who for so many years was a member of the Museum's Anthropological Division and who still is closely associated with it.

Within the period covered by this report, the scientific staff was strengthened by the addition of L. S. Russell, I. MacKenzie Lamb, E. L. Bousfield, and T. E. Lee. Dr. Russell, formerly Director of the Royal Ontario Museum of Palæontology, became the Chief of the Division of Zoology; Dr. Lamb, formerly of the British Museum, assumed the work of cryptogamic botany in the National Herbarium. Mr. Bousfield is a specialist in invertebrate zoology and Mr. Lee in archæology. On the other hand, the Museum lost through superannuation the valuable services of Mr. C. M. Sternberg who had long been in charge of the work in vertebrate palæontology. It lost also, with regret, the services of Miss Margaret Sargent, musicologist, and of Miss Josephine Hambleton; both of whom resigned to be married.

During the year the skeleton of a hooded dinosaur of the genus *Lambeosaurus*, a duplicate of one at the National Museum in Ottawa, was sent on indefinite loan to the University of British Columbia. The specimen was assembled by Mr. C. M. Sternberg and was officially accepted and made available for inspection at a suitable ceremony at the University of British Columbia on November 4. At the request of the British Museum (Natural History) at South Kensington, London, a skeleton of a Trachodont dinosaur of the genus *Edmontosaurus* was shipped in twelve sections to that institution. The latter regards it as a very valuable addition to its collection of fossil reptiles, the first from Canada.

From the point of view of the number of visitors, the Museum had a busy and successful year. Conducted tours for groups of adults and children continued as a feature. On August 10 a group of fifty British boys under the supervision of Field Marshal Sir Claude Auchinleck, G.C.B., G.C.I.E., G.C.S.I., D.S.O., O.B.E., was conducted through the Museum and shown a special program of films illustrating Canada.

The Chief Curator represented the National Museum at the meeting of the Canadian Museums Association and that of the Northeastern Conference of the American Association of Museums, October 5th to 7th, at Montreal. On June 17th, he addressed the Wild Life Conference in Ottawa on "The Role of the National Museum of Canada with Regard to Wild Life Conservation." As Chairman of the Geology Division of the Canadian Institute of Mining and Metallurgy, he attended the Annual Meeting of that Society as the Museum's representative. Miss Mabel W. Godwin, as Secretary-Treasurer of the Canadian Museums Association, also attended the joint meetings of the Association and Northeastern Conference of the American Association of Museums in Montreal.

EDUCATIONAL SERVICES

Museum educational activities were concerned with the interpretation of its collections to the public, including adults and school groups, through various media. The value of the Museum as a source of scientific and educational information is demonstrated by the increase in the number of visitors, especially school groups. Educators have gradually come to realize more and more the value of the Museum as an institution which can provide scientific information through well-arranged exhibits and loan material that can be possessed only by such an institution.

In addition to its interest in school groups, the Museum is equally concerned with adult education. Its comprehensive collections have been arranged in as representative a manner as space will permit, bearing labels in non-technical wording. A study of this material is of considerable value to a visitor in the broadening of a general education. Research is also encouraged by giving qualified students access to the study collections. By publications and correspondence, information on natural history subjects is supplied to all parts of Canada as well as to other countries.

A special exhibit representing the educational services of the National Museum was sent for display at a Rural Schools Exhibition of Natural Sciences, St-Félicien, Quebec; photographs and educational publications were lent also for display in St. Johns, Newfoundland.

Miss Mabel W. Godwin gave a broadcast during education week over radio station CFRA covering the educational services of the National Museum.

The Exhibit of the Month continued to be of popular interest. Botanical, zoological, and mineral specimens, and Indian and Eskimo material of topical or special interest were displayed.

National Museum Lectures

As part of its service to the public, the National Museum presented its annual series of lectures for children and adults. Children's lectures are given on Saturday mornings and those for adults on Wednesday

evenings. The varied program arranged by the Lecture Committee, consisting of F. J. Alcock, Chairman, W. K. W. Baldwin, W. E. Godfrey, M. F. Goudge, J. F. Henderson, M. Rioux, H. J. Scoggan, and Miss M. W. Godwin, Secretary, was planned to have as widespread an appeal as possible.

The program for the 1950-51 season was as follows:

ADULT LECTURES

Canada's Prairie Provinces, by J. M. Humphrey, Vancouver, B.C.
 Atomic Energy, by David A. Keys, M.A., Ph.D., D.Sc., F.R.S.C., Vice-President (Scientific), National Research Council; Atomic Energy Project, Chalk River, Ont.
 Canada in Film (Motion Pictures), shown through the courtesy of the National Film Board, Ottawa.
 Wild Flowers in Art, by W. K. W. Baldwin, M.B.E., M.A., Botanist, National Museum of Canada, Ottawa.
 British Columbia's Silver Horde, by A. L. Pritchard, M.A., Ph.D., Professor of Geophysics, University of Toronto, Toronto, Ont.
 Titan Quest, by L. S. Russell, M.A., Ph.D., F.R.S.C., Chief Zoologist, National Museum of Canada, Ottawa.
 South American Journey, by Harold A. Senn, M.A., Ph.D., Chief Botanist, Department of Agriculture, Ottawa.
 Overlanders (a motion picture).
 The Ceramic Family Tree, by Ian F. Wright, B.Sc., Ceramic Engineer, Department of Mines and Technical Surveys, Ottawa.

CHILDREN'S LECTURES

Motion Picture Program.
 Glass Blowing, by George Ensell, National Research Council, Ottawa.
 Children of Other Lands—Sweden (in co-operation with the Citizens' Committee on Children), Ottawa.
 Unseen Life in a Drop of Water, by E. L. Bousfield, M.A., National Museum of Canada, Ottawa.
 Hunting Ancient Animals, by L. S. Russell, Ph.D., National Museum of Canada, Ottawa.
 Adventures in the Andes, by I. M. Lamb, Ph.D., National Museum of Canada, Ottawa.
 Motion Picture Program.
 Animals of the Woods and Zoo, by Herbert Marshall, B.A., Dominion Statistician, Ottawa.

Acknowledgment is made of the assistance to the National Museum of the National Film Board in making their films available; also of the help of the Boy Scouts, Wolf Cubs, and Commissionaires on Saturday mornings in keeping order among the children who come to the lectures. Thanks are due also to the local press and radio stations for their generous co-operation.

Group Visits

Miss M. W. Godwin reported an encouraging increase in the number of school groups that visited the Museum with their teachers for particular information on one or more of the exhibits, as well as those who were given a general guided tour of the various exhibition halls. These groups were taken care of by Miss V. Humphreys of the Museum staff. Another group, numbering 7,200, held weekly classes in nature study and discussion of Indian and Eskimo cultures as part of their regular school curriculum. As well as the large number from Ottawa and vicinity, normal students, teachers, and organized school groups came from Sudbury, Kingston, Belleville, North Bay, Chalk River, in Ontario; Granby, Quebec; and from other localities; several groups came also from the United States and the United Kingdom.

Photographs

There was a regular demand for photographs on anthropological, biological, and palæontological subjects from the National Museum collections to illustrate textbooks, scientific publications, magazine and newspaper articles, and for exhibitions of wild life photography. Requests for this material were received from the United States, South America, European countries, and the United Kingdom, as well as from all parts of Canada. A representative collection of photographs was prepared for the Department of Lands and Forests, Toronto, as a contribution to its conservation program for rural schools.

Lecture Hall

As formerly, scientific and related organizations were granted the use of the lecture hall, and the public was thus given the opportunity of hearing significant lectures on a variety of subjects. Among the organizations using the hall were the Royal Society of Canada, Royal Astronomical Society, Ottawa Field-Naturalists' Club, Canadian Geographical Society, National Gallery of Canada, Logan Geological Club, and Scientific Film Group.

Publications

Scientific and educational institutions in increasing numbers made use of National Museum publications. Besides the many requests for scientific publications from all parts of the world, there was a large demand from educational institutions for those less technical in nature.

Visual Aids

Museum loan material on anthropology, biology, palæontology, and other phases of natural history went to teachers, students, and other persons in all parts of Canada. This material is lent free of charge, except for cost of transportation charges one way, to educational institutions in Canada.

ARCHÆOLOGY

Field Work

Douglas Leechman was on field work from the middle of May to the middle of September. He followed the highway from Prince Rupert, B.C., eastwards to Prince George, stopping at Terrace, Hazelton, Burns Lake, and Vanderhoof on the way, in search of archæological sites. He examined the material in the hands of private collectors and, where possible, visited the places where these had been found. From Prince George he turned south and visited Quesnel, Williams Lake, Clinton, Lillooet, and Lytton. The generous assistance of the British Columbia Provincial Police is hereby acknowledged. Numerous sites were discovered and a large collection of specimens resulted from this reconnaissance trip. Proceeding to Vancouver he then went north by steamship to Skagway and on to Carcross. He visited Atlin in northern British Columbia, Whitehorse, and Champagne where he found a large and hitherto unrecorded village site.

From Whitehorse Dr. Leechman travelled down the Yukon River in a small boat with an outboard motor, accompanied by Frank Slim, a Tlingit Indian. Stops were made at Lower Laberge, Big Salmon, Little Salmon, Carmacks, and Minto. Numerous cutbanks and other likely areas were investigated, but no archæological remains of any description were discovered along the main river itself. At Minto he abandoned the river and proceeded north by road to Mayo and on to Lake Minto where an archæological site had been reported. He was successful in finding proof of aboriginal occupation there. Returning to Whitehorse, he continued south to Teslin, Taku, and Johnson's Crossing. The return trip was made by way of Whitehorse to Vancouver by air.

In the field R. S. MacNeish undertook a brief one-week excavation of the Goessens site near Tillsonburg, Ont., in April. He worked in conjunction with Mr. J. N. Emerson and anthropology students of the University of Toronto.

Later in the spring Dr. MacNeish undertook a survey in the Pine Portage Dam basin south of Lake Nipigon to investigate sites to be flooded by the construction of a provincial dam. At Pass Lake on Thunder Cape, a few miles east of Port Arthur, an important early site was discovered. This site was excavated during the latter part of May and early June. Analysis of the artifacts and the geology revealed that this Brohm site culture is related to the Plainview artifact complex and was probably contemporaneous with Lake Algonquin (5,000 to 10,000 years ago). This represents the first site excavated in Canada that can definitely be related to Early Man materials.

During the remainder of June and in July and August, an archæological survey of the upper Mackenzie River drainage was undertaken. The area surveyed encompassed the Mackenzie River from Fort Providence to Fort Norman, the Liard River from Fort Simpson to Fort Liard, and the South Nahanni River through Dead Man's Valley. In spite of the large area covered (mainly by canoe and on foot) only sixteen sites were found. All but four were very small. One of the four larger ones seems to be important, because it had pottery on it. Pottery is significant on the upper Mackenzie River, as none is found within 1,000 miles and the area has been considered to be a non-pottery region lying between the pottery producing eastern woodlands and northeastern Siberia.

In September Dr. MacNeish returned to Manitoba and undertook an archæological survey in the Pine Falls dam base. Only three sites were found, and the waters will not be backed up sufficiently far to injure any of them seriously.

In October a paper and a report were given at the Iroquois Conference held at Red House, N.Y.

Thomas E. Lee commenced work on June 10 on an archæological survey of southwestern Ontario. Its purpose was to obtain further information on prehistoric cultural distributions, routes of travel, and stratigraphic evidence of cultural sequences, with particular emphasis on pre-Neutral sites. Parts of Norfolk, Elgin, Kent, Essex, Lambton, Huron, and Bruce Counties were examined in detail. Over twelve thousand artifacts and sherds were acquired, one hundred and ten new village sites were found, and forty-eight collections were photographed. Six single burials and one ossuary containing the remains of six individuals were removed. Many test trenches and squares were dug.

The Neutral territory was not found to extend beyond Chatham on the west. There are evidences of the earlier Point Peninsula and Owasco cultures westward to Windsor, and clear connections with Ohio through Point Pelee and Pelee Island were seen. Several large earthworks in the same area—partly or entirely destroyed by cultivation or by amateur collectors—may be related to those in Michigan.

Important extensions of the Glen Meyer Focus were found in the hills about Forest and Arkona; the flint types occurring on such sites are nearly all traceable to deposits discovered at Parkhill or to the Port Franks deposits. On the north an almost sterile area extends to the Saugeen River.

Bruce Peninsula produced some extremely important sites yielding pre-ceramic and Point Peninsula materials. On one site was found the long-sought Vinette I pottery which is stratigraphically the earliest type in New York State. Distribution of the sites argues strongly for a route of travel for early peoples from Northern Ontario across Manitoulin and small islands to the Bruce Peninsula, thence southward to the Saugeen River. Population shifts may then have followed up the Saugeen to the Grand River in Point Peninsula times, thence down the Grand to spread out along Lakes Erie and Ontario, as suggested by site distributions there.

Some later material, probably representing Petun occupation, was found in Bruce Peninsula. For positive identification, larger samples must be obtained, and the location of at least one of the Jesuit Missions to the Petuns should be established.

A very interesting development at Sarnia was the identification of sherds from a large earthwork as comparable to sherds at the Wolf site in Michigan. This may well have a bearing upon the earthworks of Essex County, for Wolf type sherds have been found at Chatham also.

Dr. Henry B. Collins, Jr., of the Smithsonian Institution, Washington, D.C., spent the field season on Cornwallis Island where he excavated an Eskimo site and was successful in finding specimens of both the Thule and Dorset cultures. This is the first occasion on which Dorset material has been found so far to the north, and it is a discovery of considerable importance, throwing light on the movement of this culture from the western Arctic to the east. It would appear from his preliminary report that the Dorset material was demonstrably older than the Thule.

Office Work

Dr. Leechman studied the material collected in the field by himself, as well as specimens submitted by other people for examination and report. He began the preparation of a paper on the archæology of southern Yukon which will sum up his work in that area from 1945 to the present. He revised the section on the Aborigines, in anticipation of a new edition of the pamphlet issued by the Northwest Territories Branch, and wrote a number of other papers which are listed below. At the request of the Arctic Institute of North America he wrote a memorandum illustrating the problems in Arctic anthropology most urgently in need of investigation.

In co-operation with the National Film Board he prepared a documentary film entitled "Making Primitive Stone Tools," started work on another film concerned with totem poles, and advised in the preparation of a film strip on the evolution of housing.

While in New York on a lecture engagement, he had an opportunity to study material collected in the Gobi Desert of Central Asia which has obvious affiliations with early cultures in the Yukon. He was enabled also to examine the archæological material in the Museum of the University of Western Ontario in London, and in the Museum of Science and Art in Rochester, N.Y. He attended sessions of the panel on Indian research and was consulted on a number of occasions by the Canadian Board on Geographic Names, when words of Indian origin were involved.

He arranged a loan of West Coast Eskimo and Indian masks for the museum in London, Ontario, and a large loan of West Coast Indian material to the Museum of Fine Arts in Montreal.

During May, Dr. MacNeish put the final touches on the Iroquois Pottery Types (Bulletin 124) and submitted it for publication. From November to January the large archæological collection from Panuco, Veraacruz, Mexico, was studied, analysed, and described. The final manuscript is 240 pages long and includes 18 plates, 12 charts, and 14 figures. It was submitted to the American Museum of Natural History in New York for publication. During the winter quarter, the Brohm site material was written up. Also, a small exhibit showing the four main archæological stages of Ontario prehistory was prepared in conjunction with Mr. P. R. Haldorsen.

Mr. Lee returned from the field in late November. All artifacts acquired by both the 1949 and 1950 survey—amounting to about 20,000 specimens—were brought to the Museum, unpacked, and sorted by sites and counties. Material dug in April at the Goessens site was included with survey finds from the same site. All artifacts were catalogued by March 8. A very large and important pottery vessel was reconstructed for illustration in a later report.

A final check was made on a paper submitted in February and now in press, "A Preliminary Report on an Archæological Survey of South-western Ontario for 1949." A somewhat similar report based upon the findings of 1949 and 1950 has been written. From early December to March extensive correspondence was carried on with collectors, an indication of the growing interest in Ontario archæology and, perhaps, of the interest stimulated through personal contacts and discussions in the course of field surveys. A few specimens were sent in, but most important are the numerous items of information contributed, bearing on new sites and upon conditions of sites in which we are interested. There are increasing indications of a desire on the part of collectors to unite into an Archæological Association for the exchange of information and for the preservation of antiquities.

Publications

- Bone Grease, by Douglas Leechman. *American Antiquity*, April, 1951.
- American Influence on Canadian French, by Douglas Leechman. *American Speech*, December, 1950.
- The Aborigines, by Douglas Leechman. In "The Northwest Territories," Department of Resources and Development.
- Yukon Territory, by Douglas Leechman. *Canadian Geographical Journal*, June, 1950.
- Loucheux Tales, by Douglas Leechman. *Journal of American Folklore*, April, 1950.
- Spades of the Past, by Douglas Leechman. *Saturday Night*, January, 1950.

Lectures

By Dr. Douglas Leechman:

- A New World for Old Adam. National Research Council Scientists' Wives' Association, April 18, 1950.
 The Eskimo and His Culture. Chalmers Church, Ottawa, April 23, 1950.
 Making Primitive Stone Tools. Public lecture, Vanderhoof, B.C., June 2, 1950.
 Early Migrants in British Columbia. Public lecture, Prince George, B.C., June 5, 1950.
 Asiatic-American Cultural Relations. B.C. Provincial Museum and Education Staff, June 26, 1950.
 Indian Tribes of the Yukon. Kiwanis Club, Whitehorse, Y.T., July 11, 1950.
 Migration of Man from Asia to America. Passengers on S.S. *Casca*, Yukon River, August 3, 1950.
 Tanning Moose Hide. Public lecture, Teslin, Y.T., August 8, 1950.
 The Loon's Necklace. Making Primitive Stone Tools. Moosehide. Anthropology Staff, University of B.C., September 10, 1950.
 The Yukon Territory. Canadian Club, Morrisburg, October 4, 1950.
 The Function of a Science Museum. Canadian Museums Assoc., Montreal, October 7, 1950.
 Yukon, Land of Gold. Women's Art Assoc., Montreal, October 17, 1950.
 First Men in the New World. Luncheon Discussion Club, Ottawa, October 20, 1950.
 The Yukon Gold Rush. Chartered Institute of Secretaries, Ottawa, November 20, 1950.
 The Indian and His Environment. Macoun Club, Ottawa, December 2, 1950.
 Tracing Prehistoric Migrations. Women's Canadian Club, London, Ontario, December 7, 1950.
 Anecdotes and Legends of the Yukon. Kiwanis Club, Ottawa, December 15, 1950.
 Myths and Masks. Archæological Institute of America, Toronto, December 28, 1950.
 Yukon Rivers and Highways. Soroptomist Club, Ottawa, January 25, 1951.
 Down the Yukon with a Camera. Women's University Club, Ottawa, February 12, 1951.
 Potlatch and Totem Poles. Museum of Art and Science, Rochester, N.Y., February 16, 1951.
 Canada's Last Frontier. Provincial Normal School, Ottawa, February 23, 1951.
 Early Eskimo Cultures. Seminar in Geography, McGill Univ., Montreal, February 26, 1951.
 British Columbia and the Yukon. Canadian Authors' Association, Ottawa, February 27, 1951.
 British Columbia Totem Poles. New York Historical Society, New York, March 6, 1951.

By Dr. R. S. MacNeish:

- World Problems in Terms of Historical Trends in Archæological Sequences. Y.M.C.A., Ottawa, May, 1950.
 Iroquois Prehistory. Iroquois Conference, Red House, New York, September, 1950.
 The Inhabitants of Hochelaga. Ottawa University, April, 1950.

Accessions

- Mr. Robert Barlow:* stone celt and blade from Quesnel, B.C.
Mr. Douglas Bell: Eskimo archæological material from Southampton Island.
Mr. Austin Cameron: two stone celts from Australia and New Zealand.
Mr. John Fenton: Eskimo clothing from Canadian Arctic.
Mrs. Forbes: stone implements from Lac la Hache, B.C.
Mrs. Nora Hare: chipped stone blade from Minto Lake, Y.T.
Mr. Thomas E. Lee: archæological collection from southern Ontario.
Dr. Douglas Leechman: archæological collections from British Columbia and the Yukon.
Mr. J. MacAlister: chipped stone implements from MacAlister, B.C.
Dr. Catharine McClellan: ethnological specimens from Carcross, Y.T.
Dr. R. S. MacNeish: archæological collection from the Northwest Territories.
Mr. J. P. Moran: wooden bowl from the Arctic.
Const. D. M. Nelson, R.C.M.P.: Eskimo specimens from Dundas Harbour.
Const. Wm. Richmond: wooden ladle from Kitwanga, B.C.
Mr. Kip Routley: chipped stone knife from François Lake, B.C.
Mr. H. F. Smith: stone mortar from Woodridge, Ont.
Mr. C. M. Sternberg: Prairie Indian stone club.

ETHNOLOGY

Marcel Rioux completed his survey on the nature and rhythm of acculturation of the Longhouse Iroquois group of the Six Nations Reserve. With Joseph Martin of Laval University as an assistant, he spent the months of July, August, and September on that Reserve. Besides data pertaining to this social anthropological inquiry, approximately 200 native songs were recorded and some selected specimens were acquired. Rorschach tests were also administered to a sociological sample of the population under study.

In the office Mr. Rioux worked mainly on his Iroquois material and made considerable progress in the writing of a monograph on the subject. He edited a special Canadian number of the *Journal of American Folklore* which appeared in August. He also prepared a paper for the *Journal of the Washington Academy of Sciences* on the subject of medicine and magic among the contemporary Longhouse Iroquois, and another on theoretical anthropology for the "*Revue de Psychologie des Peuples*." He spent considerable time classifying and cataloguing the data collected during the summer months by seasonal workers. He was appointed corresponding member for Canada of the "*Institut de Psychologie des Peuples*" of France.

Miss Margaret Sargent conducted a survey on the folk songs of Newfoundland from July 1st to the middle of September; she also obtained a considerable number of Acadian songs from Cape Breton Island. In the office she transcribed Iroquois and Huron songs which had been collected earlier for the National Museum; she also transferred a number of songs from perishable wax cylinders to sound-recording tape.

Miss Josephine Hambleton worked on the preparation of a monograph on argillite carvings. She also classified and described about 800 photographs of specimens of Indian art.

Miss Helen Creighton continued her studies in Nova Scotia. She recorded 271 folk songs, as follows: 42 songs local to this continent; 20 songs on or about Newfoundland; 9 singing games; 196 traditional songs. In addition, records were made of 4 folk tales; 2 ghost stories; 12 games and counting-out rhymes; 2 recitations; and 2 dances. Conversations at the end of the recordings furnish information regarding the speech of each district. Short items of folk-lore typed on index cards number 567. Six others, too long for such cards, were typed on manuscript paper. Most of Miss Creighton's time was spent in Halifax County where there is a great wealth of material.

Miss Carmen Roy continued her folk-lore research in Gaspé Peninsula. She recorded on sound-recording tape approximately 300 songs, a large number of folk tales, and various items of folk-lore.

Dr. Catharine McClellan continued her work in the southern Yukon after a summer's field work in the Alaska panhandle. In September she went to Carcross and remained there until the end of the year when she moved to Teslin. Both these villages are occupied by Tlingit Indians with a certain mixture of interior Kutchin. It was most desirable that a competent anthropologist should spend a winter with these people since a summer visit can give only a distorted impression of their annual cycle and material culture.

Dean Luc Lacourcière and Monseigneur F. A. Savard, both of Laval University, collected folk songs and folk tales on the Island of Shippigan, New Brunswick.

Professor Madeleine Doyon, also of Laval University, worked in Portneuf, Charlevoix, Levis, and Lotbinière counties; she collected data on numerous subjects, especially traditional games and costumes, folk technology, and literature—in all, 394 items.

ZOOLOGY

A marked expansion took place during the year, both by large additions to the regular collections and by the revival of activity in fields that have been for some time neglected. Particularly important have been the consolidating and renovating of the collections of invertebrates. The collection of fossil vertebrates and the activities associated with this collection have also been more closely integrated with the remainder of the Section. With the increase in staff and expansion of activities, much new equipment has been acquired. However, there has not been a corresponding expansion in available space, so that provision of adequate working and storage quarters is becoming increasingly difficult. Various rearrangements have been made to utilize the available space to best advantage.

At the close of the year the zoological collections consisted of 20,643 mammal specimens, 37,319 bird specimens, 2,164 reptile and amphibian specimens, and over 243 fish specimens. In the present state of the invertebrate collection, an accurate estimate of numbers cannot be given, but there are more than 6,000 lots of specimens present.

Additions to the staff are Loris S. Russell as Chief of the Section and specialist in vertebrate palæontology, 1st July; and E. L. Bousfield as specialist in invertebrate zoology, 1st June. C. M. Sternberg went on retiring leave 16th October after thirty-eight years of very productive work as a collector and investigator of fossil vertebrates for the Geological Survey and the National Museum. During most of the year the valuable services of Clyde L. Patch as chief taxidermist and herpetologist were lost to the Museum because of illness.

Turning to the work of the individual members of the Sections—L. S. Russell spent the month of July in the Flathead Valley of southeastern British Columbia, searching for fossils in the Tertiary deposits of that area. A large collection of fossil molluscs was obtained. Study of this collection formed a major part of Dr. Russell's research work during the remainder of the year. Other research projects were: fossil molluscs of the Bearpaw formation, Saskatchewan; Recent land snails of the Cypress Hills; Devonian fishes of the Gaspé region; Triassic fishes of the Rocky Mountains; Cretaceous mammals from Alberta; Tertiary mammals from Saskatchewan. With the retirement of Mr. Sternberg, Dr. Russell assumed charge of the collection of fossil vertebrates and the direction of the laboratory of vertebrate palæontology. In addition, he has had the general administration of the Section and since October has functioned as the Secretary-Treasurer of the Canadian Museums Association.

W. Earl Godfrey spent three months studying and collecting the birds of the Peace River and Lesser Slave Lake regions of northern Alberta.

During the year he completed his report on the results of this work. Other investigations completed were: description of a new subspecies of Yellowthroat (*Geothlypis*); revision of races of the Boreal Chickadee east of the Rockies; taxonomic study of the Myrtle Warbler. Some time was spent in editorial work on various ornithological manuscripts, on a revision of Special Contributions 43-3 and 43-4, and on part of the American Ornithological Union Check List. Many inquiries regarding birds were answered, the most important being requests for information by the National Film Board, and an inquiry regarding the dates of dispersal of the English Sparrow into North America. Bird specimens were identified for the New Brunswick Museum, the British Columbia Provincial Museum, the Manitoba Museum, the Royal Ontario Museum of Zoology, the Canadian Wildlife Service, the Illinois Natural History Survey, the State College of Washington, and various private individuals. Bibliographic work on the literature of ornithology was continued. Accessioning, labelling, and arranging of the bird collection were supervised, as well as the filing of ornithological data.

C. M. Sternberg spent nearly two months in field work, collecting fossil fishes and eurypterids from the Devonian of Gaspé, amphibian tracks from the Mississippian of Parrsboro, N.S., and amphibian remains from the Pennsylvanian of Joggins, N.S. In September he went to Vancouver to supervise mounting of the skeleton of a duck-billed dinosaur at the University of British Columbia. Up to the date of his retirement he was responsible for the care of the collection of fossil vertebrates and for the direction of the laboratory of vertebrate palæontology.

Austin W. Cameron carried on field work for three months in southern Labrador and northern Newfoundland, collecting mammal and bird specimens with special reference to the problem of the origin of the Newfoundland fauna. As a result of this work he was able to revise his manuscript on the terrestrial mammals of Newfoundland and to make a taxonomic study of the terrestrial mammals of the islands of the Gulf of St. Lawrence. Other research projects were the taxonomic study of collections of mammals from the southern Yukon and from Prince Edward Island and a study of the Nova Scotia Wildcat (*Lynx gigas*) in collaboration with the Royal Ontario Museum of Zoology. Six semi-popular leaflets were prepared on the life histories of the large mammals exhibited in the Museum. The manuscript for a Special Contribution, "Bats of Canada," was completed. Many inquiries concerning mammals and some regarding reptiles and amphibians were answered. Specimens of mammals were identified for the Division of Entomology, Department of Agriculture, and for the Archæology Section of the National Museum. Curatorial duties included the identification of the mammals added to the collection and the supervision of the accessioning, labelling, and arranging of the specimens. Bibliographical work on the literature of mammalogy was continued. A number of Saturday mornings were spent directing the Boy Scout group in attendance at the children's lectures.

E. L. Bousfield carried out three and a half months of field work along the Atlantic Coast of Canada, mostly in Nova Scotia and New Brunswick. Special attention was given to the estuary of Miramichi River. The object of this work was, first, to obtain data on the relationships between environment and distribution of marine invertebrates and,

second, to investigate factors controlling barnacle fouling. Subsequently much time was spent sorting and identifying the collections made and assembling the data. Preliminary results were obtained on the relationship between plankton distribution and salinity in the Miramichi estuary. Collections of barnacles in the National Museum and the Royal Ontario Museum of Zoology were identified. His duties have also included sorting and accessioning of the collections made during the field work, rearranging the large collection of Recent molluscs turned over by the Geological Survey, and renovating the collection of spirit-preserved material. In the absence of Mr. Patch, Mr. Bousfield has supervised the school loans of bird and mammal specimens.

Claude E. Johnson prepared the lay-outs for the Bison mural and the Polar Bear mural, which occupy the space above the respective habitat groups, and also completed painting them. He also made progress on a similar mural of the White Whale. He worked on a diorama representing the Huron Indian version of the Nativity, painting the background and constructing many of the accessories. During the field season he assisted in the routine handling of correspondence and accessioning.

Stuart D. MacDonald was with Mr. Godfrey on field work in northern Alberta. During the remainder of the year he prepared numerous bird and mammal skins and mounted specimens for the exhibition and school loan series. He participated in the cleaning of the large habitat groups and assisted in the rearrangement of the study collections. Towards the end of the year he made preparations for a zoological expedition to northern Ellesmere Island, for which he left by air on 26th March.

Colin L. Thacker worked with Mr. Bousfield during the summer, assisting in the collecting of marine invertebrates. On his return to the Museum, he prepared bird and mammal skins and mounted some specimens. He prepared miniature dioramas of mammal habitat groups, accessioned mammal specimens, rearranged parts of the study collections, and participated in the cleaning of the large mammal habitat groups.

George Blanchard prepared osteological material and the skins of mammals. He participated in the cleaning of the habitat groups. During the field season, when other staff members were absent from the Museum, he carried on the work of the laboratory.

J. Skillen and H. L. Shearman were engaged in the preparation of fossil vertebrates. The skeleton of a crested duck-billed dinosaur was prepared for shipment to the University of British Columbia. Subsequently an unusually fine skull of a duck-billed dinosaur, with associated skeletal parts, was cleaned and mounted. The incomplete skull of a flesh-eating dinosaur, which was the first dinosaur skull to be found in Canada, was remounted. Some work was done on Devonian and Triassic fishes. A collection of fossil molluscs made by Dr. Russell in southeastern British Columbia was prepared. In the absence of Dr. Russell and Mr. Sternberg, Mr. Skillen directed the work of the laboratory of vertebrate palæontology.

Miss P. M. Hurlbert reviewed ornithological literature and incorporated the data on distribution maps, accessioned specimens, compiled bibliographic data, and looked after office during absence of staff members in the field.

Miss Jean K. Cameron performed most of the stenographic work of the Section, handling the correspondence and typing manuscripts. She also did the filing of records, preparation of bibliographic cards, and general clerical work.

Collaboration in various projects was enjoyed during the year with the following institutions: Canadian Wildlife Service; Division of Entomology, Department of Agriculture; Atlantic Biological Station, St. Andrews, N.B.; Royal Ontario Museum of Zoology; Royal Ontario Museum of Palæontology; Pacific Biological Station, Nanaimo, B.C.

Specimens of mammals were lent for scientific study to the Biology Section, National Research Council; National Film Board; Royal Ontario Museum of Zoology; U.S. National Museum; University of Connecticut; New York State Museum; University of Kansas. Bird specimens were lent to the National Film Board; Royal Ontario Museum of Zoology; U.S. National Museum; Wildlife Management Institute, Washington, D.C.; Carnegie Museum, Pittsburgh, Pa.; Doane College, Crete, Nebraska; Museum of Vertebrate Zoology, University of California. Fish specimens were lent to the Department of Zoology, Cornell University. Invertebrates were lent to the Department of Zoology, University of California in Los Angeles. Casts of fossil vertebrates were given to the U.S. Geological Survey.

For use in the Section's research projects, bird specimens were borrowed from the British Columbia Provincial Museum; U.S. National Museum; Wildlife Management Institute, Washington, D.C.; Carnegie Museum, Pittsburgh; Mr. Hoyes Lloyd, Ottawa. Specimens of fossils were borrowed from the Geological Survey of Canada and the Royal Ontario Museum of Palæontology. During the year twenty individuals engaged in scientific studies visited the Museum and made use of the zoology collections in connection with their work. Facilities were provided during their visits as well as varying amounts of assistance from the scientific staff.

Lectures

- The Zoology Section, National Museum of Canada. By Loris S. Russell. Radio Station CFRA, Ottawa, 6th November.
 Introduction to the Invertebrates. By E. L. Bousfield. Macoun Field Club Senior Group, Ottawa, 12th February.
 Life in a Drop of Water. By E. L. Bousfield. Museum Children's Lecture Series, 17th February.
 The Age of the Rocky Mountain Uplift. By Loris S. Russell. Logan Club of the Geological Survey of Canada, Ottawa, 20th February.
 Titan Quest. By Loris S. Russell. Museum Lecture Series, 21st February.
 Hunting Ancient Animals. By Loris S. Russell. Museum Children's Lecture Series, 24th February.

Publications

- Description of a New Northwestern *Geothlypis*. By W. Earl Godfrey. Canadian Field-Naturalist, vol. 64, No. 3.
 A New Chipmunk (*Tamias*) from Ontario and Quebec. By Austin W. Cameron. Journal of Mammalogy, vol. 31, No. 3.
 Arctic Fox on Cape Breton Island. By Austin W. Cameron. Canadian Field-Naturalist, vol. 64, No. 4.
 When the Crossbills Come. By W. Earl Godfrey. Ottawa Field-Naturalists' Club News Letter, No. 9, p. 5.

- Birds of the Cypress Hills and Flotten Lake Regions, Saskatchewan. By W. Earl Godfrey. National Museum of Canada, Bulletin 120, 96 pp.
- The Tertiary Gravels of Saskatchewan. By Loris S. Russell. Royal Society of Canada, Transactions, ser. 3, vol. 44, sec. 4, pp. 51-59.
- When Ottawa was a Seaport. By Loris S. Russell. Ottawa Field-Naturalists' Club News Letter, No. 9, pp. 4, 5.
- Brünnich Murres visit Ottawa. By W. Earl Godfrey. Ottawa Field-Naturalists' Club News Letter, No. 9, pp. 6-9.
- Reviews (9) of Current Literature. By W. Earl Godfrey. Canadian Field-Naturalist, vol. 64, pp. 126, 156-158, 190, 220. Bird-banding, vol. 21, pp. 82-83, 165, 172.
- Reviews (1) of Current Literature. By Austin W. Cameron. Canadian Field-Naturalist, vol. 64, p. 158.

MAMMALS

Accessions

By Gift:

- Blakely, David J., Ottawa, Ont.: 3 chipmunks.
- Bruckhausen, Walter, Pelican Portage, Alberta: 1 wolf skull.
- Buss, I. O., Pullman, Wash.: 5 mammals from Burwash Landing, Yukon.
- Churchman, J. A., Regina, Sask.: 1 plaster cast of puma track.
- Dery, Dr. D. A., Quebec, P.Q.: 1 New York long-tailed weasel.
- Elliott, Ernie, Ottawa, Ont.: 1 red fox.
- Fleming, James, Riverhead, Long Island, N.Y., U.S.A.: 9 mammals.
- Jones, Henry, Cloyne, Ont.: 9 snowshoe hare skulls.
- Lawrie, A. H., Toronto, Ont.: 12 mammals (skeletal material) from Arctic Archipelago.
- Manning, T. H., Ottawa, Ont.: 11 woodchucks, 1 porcupine.
- Nelson, D. M., Calgary, Alberta: 9 mammal skulls from Dundas Harbour, Devon Island, N.W.T.
- Savile, D. B. O., Ottawa, Ont.: 13 mammal skins and skulls from Chesterfield Inlet, N.W.T., and a star-nosed mole (in alcohol) from Great Whale River, Que.
- Stevens, W. E., Aklavik, N.W.T.: 5 wolves.
- Superintendent, Glacier National Park, B.C.: 1 marten.
- Superintendent, Jasper National Park, Alberta: 9 mammal skulls, 1 adult puma and 3 cubs, skins and skulls.
- Wright, Gerald, Superintendent, Burwash Industrial Farm, Burwash, Ont.: 1 elk.

By Purchase:

- Kelsall, John, Ottawa, Ont.: 3 grizzly bears, skins and skulls, from Bathurst Inlet, N.W.T.
- MacDonald, Roderick, Bayhead, N.S.: 3 Nova Scotia wildcats, 1 skin and 3 skulls from Nova Scotia.
- Manning, T. H. and Andrew MacPherson, Ottawa, Ont.: 146 mammals from east side of James Bay.
- Wood, A. A., Chatham, Ont.: 9 mammals.

By Exchange:

- Quay, W. B., University of Michigan, Ann Arbor, Michigan: 12 mammals from Michigan.

Museum Expedition:

- Cameron, Austin W. and Marshall Ronalds, Museum Expedition to Newfoundland and north shore of the Gulf of St. Lawrence: 44 mammals.
- Godfrey, W. Earl, Stuart D. MacDonald, and Ian Allen, Museum Expedition to Lesser Slave Lake-Peace River areas, Alberta: 7 mammals, 2 jars of pickled mammals.

By Members of Staff:

- Hurlbert, Miss P. M., Ottawa, Ont.: 1 big brown bat.
- MacDonald, Stuart D., Ottawa, Ont.: 5 bats and 1 lemming.

BIRDS

By Gift:

- Anderson, Dr. R. M., Ottawa, Ont.: 4 skins from Quebec.
 Banning, Miss Anne, Ottawa, Ont.: 1 myrtle warbler.
 Bennett, Charles H., Ottawa, Ont.: 1 chimney swift, 1 yellow warbler, and 1 European starling.
 Blakely, David J., Ottawa, Ont.: 10 skins from Richmond, Ont.
 Bourguignon, A. E., Ottawa, Ont.: 8 skins from Ottawa district.
 Burns, Miss Dolores, Ottawa, Ont.: 1 tree swallow.
 Buss, Dr. Irven O., Pullman, Washington, U.S.A.: 3 skins from Burwash Landing, Yukon.
 Cameron, John W., Port Hood, N.S.: 1 mourning dove, wings.
 Campbell, Mitchell, Ottawa, Ont.: 1 pied-billed grebe.
 Canadian Wildlife Service: George Boyer, Sackville, N.B.: 2 swamp sparrows and 1 short-billed marsh wren; R. M. MacKay, Vancouver, B.C.: 1 trumpeter swan; David A. Munro, Vancouver, B.C.: 1 trumpeter swan; Leslie M. Tuck, St. Johns, Newfoundland: 1 golden eagle and 1 yellow-breasted chat; H. R. Webster, Truro, N.S.: 1 Canada goose.
 Coates, D. F., Montreal, Que.: 2 Canada jays from Newfoundland, Labrador.
 Cowtan, Mrs. Charles, Ottawa, Ont.: 1 starling.
 Crosby, J. Gordon, Ottawa, Ont.: 1 American scoter.
 Gaw, John D., White Lake, Ont.: 1 Brünnich murre.
 Hanson, Harold C., Urbana, Ill.: 5 horned larks, 2 American pipits, 1 Savannah sparrow, from Perry River, N.W.T.
 Harper, Dr. Francis, Rensselaerville, N.Y.: 7 skins from Nueltin Lake District, N.W.T.
 Hayward, Roy, Eureka Meteorological Station, Ellesmere Island, N.W.T.: 1 snowy owl from Saunders Island, Greenland.
 Herring, H. F., R.C.M.P., Fort Smith, N.W.T.: 1 fulmar from Perry River District, N.W.T.
 Hohn, E. O., Edmonton, Alberta: 1 Ross' goose skull and 7 bird stomachs from Northwest Territories.
 Lawrence, Mrs. Louise de K., Rutherglen, Ont.: 1 black-throated green warbler's nest; 9 red crossbills and 2 white-winged crossbills.
 MacDonald, K. A., Bayhead, N.S.: 1 meadowlark.
 McKiernan, Frank H., Stoughton, Sask.: 1 red-winged blackbird.
 McMullen, W. J., Stittsville, Ont.: 1 Brünnich murre.
 Millman, Barry, Ottawa, Ont.: 2 Brünnich murre from Gatineau Park, Que.
 Mills, Eric, Ottawa, Ont.: 1 yellow-bellied sapsucker.
 Monette, J. M., R.C.M.P., Ottawa, Ont.: 1 Brünnich murre from Gatineau Point, Que.
 Nelson, D. M., Calgary, Alberta: 3 bird skulls.
 Nichols, Lloyd C., Smith Falls, Ont.: 1 razor-billed auk.
 Ommanney, G. G., Hudson Heights, Que.: 7 skins.
 Ormsby, Morris, Ottawa, Ont.: 1 common loon (mounted).
 Outram, Miss Alice, Ottawa, Ont.: 1 hermit thrush.
 Pyefinch, Sydney, Ottawa, Ont.: 1 black and white warbler.
 Rausch, Dr. Robert, Anchorage, Alaska: 5 boreal Hudsonian chickadees and 1 black-capped chickadee.
 Savile, Dr. D. B. O., Ottawa, Ont.: 29 salted skins, a meadowlark, 1 wing, and 9 sets of bird's eggs.
 Savile, C. E., D. B. O. Savile, and T. F. T. Morland, Ottawa, Ont.: 1 ring-necked duck.
 Sweatman, Gordon, Hamilton, Ont.: 1 barn swallow.
 Waterston, C. D., Camrose, Alberta: 1 long-eared owl and 1 mallard.

By Purchase:

- Manning, T. H., Ottawa, Ont.: 497 skins from east side of James Bay.
 Reynolds, Keith, London, Ont.: 381 skins from southern Ontario.
 Wood, A. A., Chatham, Ont.: 33 birds.

By Exchange:

- Carnegie Museum, Pittsburg, Pa.: 1 whooping crane.

Museum Expedition:

Cameron, Austin W. and Marshall Ronalds, Museum Expedition to Newfoundland and north shore of Gulf of St. Lawrence: 43 birds, 1 bird's nest.
 Godfrey, W. Earl, Stuart D. MacDonald, and Ian Allen, Museum Expedition to Lesser Slave Lake-Peace River areas, Alberta: 479 birds.

By Members of Staff:

MacDonald, Stuart D., Ottawa, Ont.: 1 mourning dove from Bayhead, N.S.

AMPHIBIANS AND REPTILES

By Gift:

Carter, Mrs. J. W., Ottawa, Ont.: 1 eastern painted turtle from Rowley, Mass., and 1 common painted turtle, Rideau Canal, Ottawa, Ont.
 Dellaire, William, Ottawa, Ont.: 1 mudpuppy found in Patterson's Creek, Rideau Canal, Ottawa, Ont.
 Littlefield, Larry, Ottawa, Ont.: 1 painted turtle collected at Hog's Back, Ottawa, Ont.
 Platt, Hugh, Ottawa, Ont.: 1 milk snake found at Aylmer, Que.
 Purcell, Jack, Ottawa, Ont.: 1 snake (foreign) found in a bunch of bananas, Ottawa, Ont.

By Members of Staff:

Cameron, Austin W., Ottawa, Ont.: 3 toads from La Tabatière, Que.

INVERTEBRATES

By Gift:

Graham, Mrs. Wm., Ottawa, Ont.: 2 fine specimens of the Melon Shell (*Melo diadem Lam.*), from Australia.
 Huntsman, Dr. A. G., Fisheries Research Board of Canada, Toronto, Ont.: 1,308 vials of marine crustacea, mostly Amphipoda, from Bay of Fundy.

Museum Expedition:

Bousfield, E. L. and C. L. Thacker, Museum Expedition of Maritime Provinces: 99 pint sealers and 20 quart sealers of marine invertebrates, 56 vials of marine plankton, 112 vials of marine bottom fauna, 36 vials of fresh-water bottom fauna.

FOSSILS

By Purchase:

Roy, Theodore, Maguasha West, Que.: 1 large concretion containing skeleton of *Eusthenopteron foordii*, Upper Devonian Maguasha.

Museum Expedition:

Russell, L. S., Museum Expedition to Flathead Valley, B.C.: large collection of fresh-water molluscs from Kishenehn formation.
 Sternberg, C. M., Museum Expedition to Gaspé and Bay of Fundy: large series of ostracoderms and eurypterids from Middle Devonian at D'Aiguillon, Quebec, footprints from Parrsboro, N.S., Amphibian remains from Joggins, N.S.

NATIONAL HERBARIUM

Field Work

A. E. Porsild, Chief Botanist, from July 6 to 20, 1950, attended the Seventh International Botanical Congress at Stockholm, Sweden, to which he had been elected a Vice-President. He left Ottawa on May 4 and returned on August 28. Before and after the Congress he spent considerable time in the herbaria of the Royal Botanical Gardens at Kew and the

British Natural History Museum, both in London, the herbarium of the University of Copenhagen and the herbarium of the National Museum of Sweden, Stockholm, for the purpose of examining historical collections of plants made in the Canadian Arctic by early British expeditions in search of the Northwest Passage. He also studied methods of preservation and exhibition of plant material, and at Kew and in the British Natural History Museum he consulted the curators with regard to their war experiences in emergency evacuation and preservation of irreplaceable plant material. The experience of the staff of the British Natural History Museum, which was bombed and partially burned during the war, was particularly valuable. From July 21 to 30 he took part in a botanical excursion to Swedish Lapland, organized by the International Botanical Congress. On November 9 to 11, as Canadian delegate, he attended the Alaskan Science Conference held at Washington, D.C.; on February 22 to 24 he attended a meeting of the Board of Governors of the Arctic Institute of North America held at Washington, D.C.; and on March 17 he presented a paper at the Annual Meeting of the Ontario Federation of Naturalists at Kingston, Ont.

H. J. Scoggan, accompanied by W. K. W. Baldwin, made a botanical survey during the months of June, July, and August of the prairie district of southwestern Manitoba, the wooded area between Riding Mountain and The Pas, and the Barren Ground region of Baralzon and Nejanilini Lakes northwest of Churchill; 1,382 collections of vascular plants were made, as far as possible enough material being taken in each case to make up six duplicates for exchange purposes. Comprehensive collections were made to show the composition of the more significant ecological habitats, and photographs taken to illustrate general topography as well as vegetation types. Ten days were spent in Winnipeg at the end of the season in a study of the plant collections of the University of Manitoba, the Dominion Rust Research Laboratory, and the Manitoba Provincial Museum; 1,441 sheets of specimens were brought back to Ottawa from these institutions for critical study.

Office Work

A. E. Porsild prepared a summary report for the Annual Report of the National Museum (1949-1950), for which he also edited and revised a manuscript by Dr. I. Hustich of Helsingfors, Finland, entitled "Forest-botanical Notes on the Knob Lake Area of the Interior of Labrador Peninsula." Upon his return from Europe he prepared a 16-page report on the "Proceedings of the Seventh International Botanical Congress at Stockholm, Sweden, 1950." During the year he prepared "Bird Notes from Banks and Victoria Islands" and "Two New *Oxytropis* from Arctic Alaska and Yukon," a report on the Alaskan Science Conference in Washington, and a series of lectures on arctic botany. He spent considerable time correcting galleys and page proofs of various reports, including his 400-page paper, "Botany of Southeastern Yukon," published as National Museum Bulletin No. 121, reviewing applications for grants-in-aid, as well as preparing various reports for the Arctic Institute of North America. A total of 1,760 plants were named, most of which were submitted for identification and report by various government departments or by Canadian and foreign universities and botanical institutions. The

more significant among them were the important collections made by I. Hustich in Labrador in 1949 and by V. C. Wynne-Edwards in Baffin Island as a member of the Arctic Institute Baffin Island Expedition of 1950. He checked 11,093 mounted specimens before insertion in the Herbarium and selected 5,567 duplicate specimens for distribution to other herbaria on regular exchanges. As other duties permitted, he continued work on a paper dealing with the flora of the western Arctic Archipelago which is based largely on field work in Banks and Victoria Islands, 1949.

H. J. Scoggan prepared a 33-page summary report on the 1950 field season in Manitoba for the Annual Report, and a 13-page account of the National Museum botanical surveys in central and northern Manitoba during the summers 1948-50 for the "Arctic Circular." He also prepared descriptive text for a folder illustrating 15 Canadian wild flowers. Considerable time was spent in making entries in the card index, which is serving as the framework for a proposed flora of Manitoba. He carried out field work in Manitoba during the summer, and on his return named the 1,382 vascular plants collected. During the year he determined miscellaneous collections of plants, totalling approximately 1,025 specimens, and studied and revised the 1,441 mounted plant specimens on loan from Manitoba botanical institutions. He attended the meetings of the Canadian Museums Association held in Montreal in October.

I. Mackenzie Lamb joined the staff of the National Museum on April 26, 1950, and at once began the reorganization of the Cryptogamic section of the Herbarium, having first elaborated a modern taxonomic system by which to arrange the Lichen Herbarium. On June 1st he commenced the sorting, packeting, and labelling of his Argentine Patagonian lichen collections of 1950 and prepared them for insertion in the Herbarium, making up several sets of duplicates (about 800 numbers) for distribution to other institutions. With the help of Miss Schwartz, he catalogued in his manuscript index of lichen species all new entities appearing in systematic publications up to the present date. During the year he determined 11 miscellaneous collections of lichens, totalling approximately 363 specimens, which were submitted for determination by various other botanical institutions and, besides, revised various herbarium collections of *Stereocaulon* from North American and European Institutions in continuation of his work on a monograph of that genus. He completed the manuscript of a paper on the "Morphology, Phylogeny, and Taxonomy of the Lichen Genus *Stereocaulon*" for publication in the Canadian Journal of Botany. From March 19 to 25 he made a visit to the Farlow Herbarium, Cambridge, Mass., in order to study type specimens and related literature.

W. K. W. Baldwin was responsible during the year for the filing of mounted specimens in the general Herbarium and for the selection of plant material requested for loan by other botanical institutions. He also compiled notes and reports on the photographic material obtained during the 1949 Foxe Basin Expedition and wrote two preliminary reports on the plants collected by him in James and Hudson Bays in 1948 and 1949. He selected photographs and prepared notes for Dr. I. Hustich's report on the forest ecology of James Bay and during the year spent considerable time on a preliminary sorting and cataloguing of the "Lawson Herbarium", which was presented recently by Mount Allison University. He conducted

the spring, autumn, and winter programs of the Macoun Field Club which involved 57 meetings and excursions and also arranged two special exhibits and two meetings for parents, friends, and sponsors. He served on the Museum Lecture Committee, attending all meetings and lectures, and assisted in various ways with the Saturday morning Museum lectures; he further served on the Departmental Joint Council, attending all meetings of Council and staff side, except during period of summer field work. He arranged the exhibition of Mrs. Woolgar's wild flower paintings and the loan of Robert Holmes' paintings for a lecture on wild flowers.

Miss Hilda Harkness was responsible for the mounting, labelling, cataloguing, and general care of specimens in the Herbarium as well as for the loan and exchange service. She mounted 5,071 plant specimens for insertion in the Herbarium and, assisted by Miss Schwartz and Miss Yendall, completed the exact counting by numbering all mounted specimens in the Herbarium, work which was initiated last year. Work on the permanent card index, giving exact numbers of specimens in all families and genera in the Herbarium, was brought up to date. Upon delivery of 17 new herbarium cases, the Herbarium was rearranged to relieve serious congestion in the old cases. Miss Harkness was responsible also for the sorting, cataloguing, and arranging of incoming material, and assisted in checking manuscripts and proof-reading publications, besides preparing an index for Mr. Porsild's "Botany of Southeastern Yukon." On June 19 to 22 she went to Mount Allison University at Sackville, N.B., where she prepared and packed the "Lawson Herbarium" for shipment to Ottawa.

Miss Barbara Schwartz spent approximately half her time during the year assisting Dr. Mackenzie Lamb in the rearranging of the lichen herbarium, sorting and packaging duplicates of Macoun's "Canadian Lichens" for distribution, indexing entries in lichen literature pertaining to publication and description of new species, varieties, and forms, and in checking lichen specimens cited in Macoun's "Catalogue" against specimens actually in the Herbarium. She also made a number of pen-and-ink drawings of lichens. For the general Herbarium she mounted 4,101 plants, inserted four issues of the Gray Herbarium Index, and in various ways assisted Miss Harkness in the numbering and indexing of the mounted specimens in the Herbarium.

Miss Joan Yendall joined the staff of the Herbarium on May 1. In addition to typing, she mounted 1,921 plants and assisted in various ways in the Herbarium maintenance.

Accessions, Loans, and Exchanges

During the year 8,709 herbarium specimens were received by exchange or purchase, 1,505 by donation, and approximately 6,609 resulted from field work or were obtained in exchange for determinations by members of the National Museum staff. Specimens numbering 1,027 were loaned to other botanical institutions and 1,576 were borrowed; 6,736 duplicate specimens resulting from the field work of the Herbarium staff were distributed to Canadian and foreign herbaria in continuation of exchanges. A total of 11,093 specimens were mounted and inserted in the Herbarium, bringing the total of numbered flowering plants and ferns in the National Collection to 204,980 (according to the new and revised count, which does not include specimens in the Cryptogamic Herbarium).

Among the more notable accessions of the year are the collections of 1,382 plants made by H. J. Scoggan and W. K. W. Baldwin in Manitoba; 852 plants collected in central Ungava by Dr. I. Hustich; 266 plants collected in the Bathurst Inlet, N.W.T., by J. P. Kelsall and E. H. McEwen of the Dominion Wildlife Service; 262 plants collected in Newfoundland by Dr. R. Tuomikoski of Helsingfors, Finland; 300 plants collected by Mr. and Mrs. T. H. Manning, Ottawa, in Salisbury, Southampton, and S. W. Baffin; 450 plants collected by Professor V. C. Wynne-Edwards, Aberdeen, Scotland, in the Clyde Inlet area of Baffin Island. The most important accession, however, is the large private herbarium of George Lawson (1827-1895) which was presented to the National Museum by Mount Allison University in June. It will be mounted and carefully examined and catalogued before its final incorporation into the National Collection.

The National Museum gratefully acknowledges the generous donations of the following collections:

- Dr. H. B. Collins, Jr., Smithsonian Institution, Washington, D.C.: plants from Cornwallis Island, 104.
- O. C. Furniss, Alberni, B.C.: plant from British Columbia.
- Dr. I. Hustich, Helsingfors, Finland: plants of Labrador, 25.
- T. H. and E. W. Manning, Ottawa: plants of Baffin Island and Hudson Bay, 325.
- Stuart MacDonald, Ottawa: plants of Prince Patrick Island, 36.
- Dr. R. Tuomikoski, Helsingfors, Finland: plants of Newfoundland, 262.
- Dr. George Turner, Ft. Saskatchewan, Alta.: plants of Alberta, 135.
- Universitets Institution for Systematisk Botanik, Uppsala, Sweden: lichens of South America and Scandinavia, 137.
- Dr. V. C. Wynne-Edwards, Aberdeen, Scotland: plants of Baffin Island, 480.

Publications

The following articles were published by the staff of the National Herbarium during the year:

- Vascular Plants of Nuelin Lake, N.W.T. By A. E. Porsild. *Ann. Rept., Nat. Mus. Canada*, 1950, pp. 72-83.
- A Biological Exploration of Banks and Victoria Islands. By A. E. Porsild. *Arctic*, vol. 3: 45-54 (1950).
- Plant Life in the Arctic. By A. E. Porsild. *Can. Geographic Jour.*, 42: 120-145 (1950).
- Bird Notes from Banks and Victoria Islands. By A. E. Porsild. *Canadian Field-Naturalist* 65: 40-42 (1951).
- The Flora of Bic and the Gaspé Peninsula, Quebec. By H. J. Scoggan. *Nat. Mus. Canada, Bull. No. 115*: 1-339 (1950).
- Families of Flowering Plants. By H. J. Scoggan. *Canadian Nature*, May-June: 98-100 (1950); Sept.-Oct.: 134-136 (1950).
- Catkins of Spring. By H. J. Scoggan. *Canadian Nature*, May-June: 107-111 (1950).
- Wild Mushrooms. By H. J. Scoggan. *Canadian Nature*, May-June: 88-89 (1950).

Lectures

- Plant Life in the North American Arctic. By A. E. Porsild. Canadian Society of Forest Engineers, Ottawa, April 19, 1950; and the Annual Meeting of the Ontario Federation of Naturalists, Kingston, Ont., March 17, 1951.
- The Vascular Flora of the North American Arctic. By A. E. Porsild. Seventh International Congress, Stockholm, Sweden, July 14, 1950.
- The Canadian Arctic. By A. E. Porsild. Grønlandsk Selskab, in the National Museum of Denmark, Copenhagen, June 14, 1950.

- The Flora and the Vegetation of Arctic North America. By A. E. Porsild. Joint meeting of the Botanical Zoological and Geological Societies of Denmark, Copenhagen, June 15, 1950.
- The Vegetation and Flora of Arctic Alaska and Yukon. By A. E. Porsild. Alaskan Science Conference, Washington, D.C., November 11, 1950.
- Botanical Approach to the Study of Pleistocene Geology. By A. E. Porsild. Logan Club, National Museum, April 25, 1950.
- Trees of Ontario. By H. J. Scoggan. Broadview Public School, Ottawa, January 23 and 30, 1951.
- Robert Holmes, Naturalist and Painter. By W. K. W. Baldwin. Ottawa Field-Naturalist's Club, April 18, 1950.
- Wild Flowers in Art. By W. K. W. Baldwin. National Museum Wednesday Evening Series, November 15, 1950.
- Adventures in the Andes. By I. Mackenzie Lamb. National Museum Saturday Morning Series, March 3, 1951.

During the year 133 visitors from Canada and abroad visited the National Herbarium for shorter or longer periods for the purpose of examining specimens or for consultation with members of the staff.

A POSSIBLE EARLY SITE IN THE THUNDER BAY DISTRICT, ONTARIO

By Richard S. MacNeish

During the last two weeks of May, 1950, a brief archæological reconnaissance of the Pine Portage Dam basin, just south of Lake Nipigon, was undertaken. About the time of the completion of the survey it was recommended by various people in Port Arthur, Ontario, that I inspect the Brohm archæological collection at Pass Lake. On June the 2nd I had the opportunity of visiting Mr. Brohm at Pass Lake, Ontario, about 20 miles east of Port Arthur.

The collection consisted of two typical Plainview points and a series of large blades. All of these artifacts were of the same material (a jaspery taconite), and Mr. Brohm informed me that he had found all of them while ploughing his recently cleared field a quarter mile west of Pass Lake. Since I had shown considerable interest in the Plainview points, Mr. Brohm took me out to the ploughed field. Taconite chips and parts of artifacts were fairly abundant on the surface of the northeastern part of the ploughed area and in the road to the field (Figure 1). Furthermore,

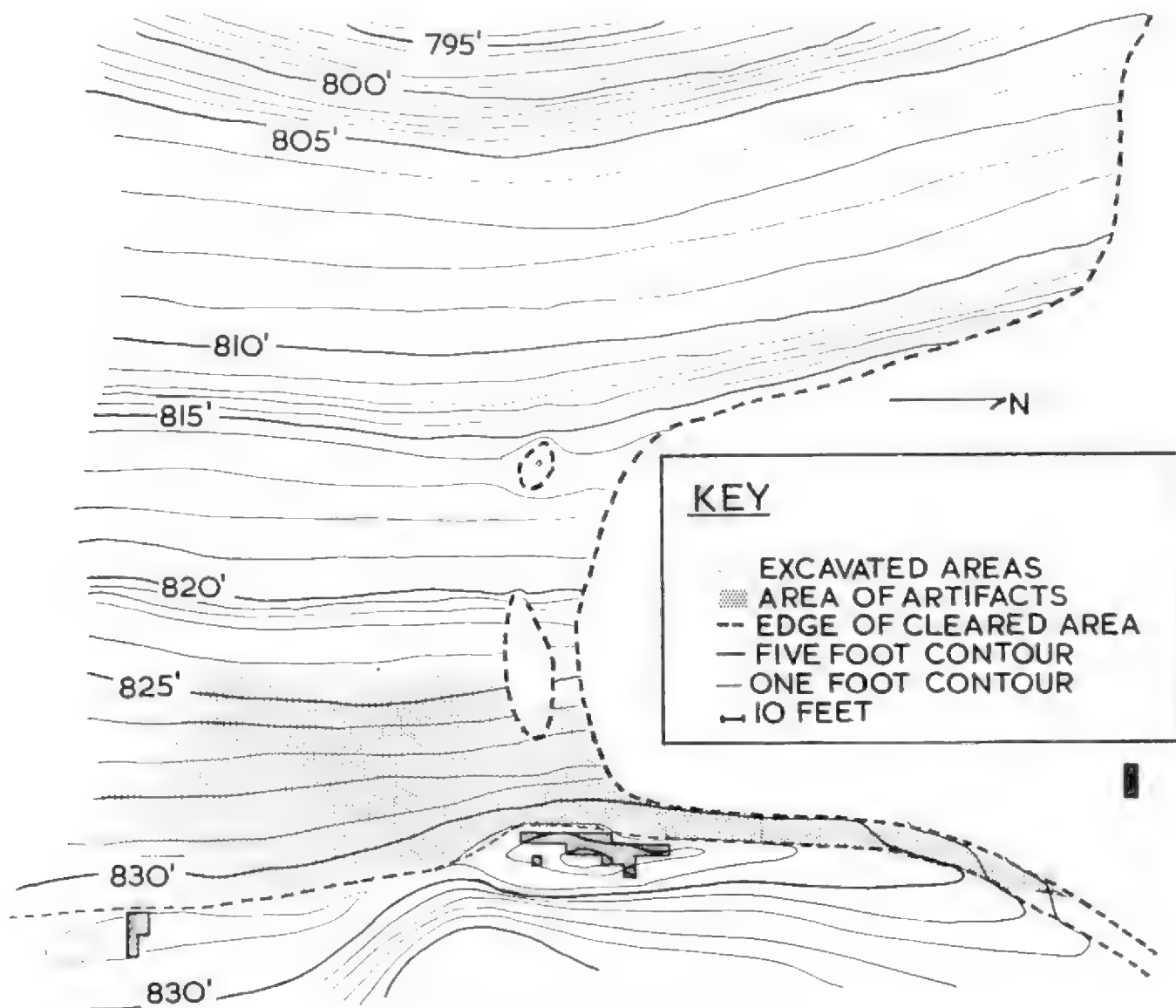


Figure 1. Map of Brohm site.

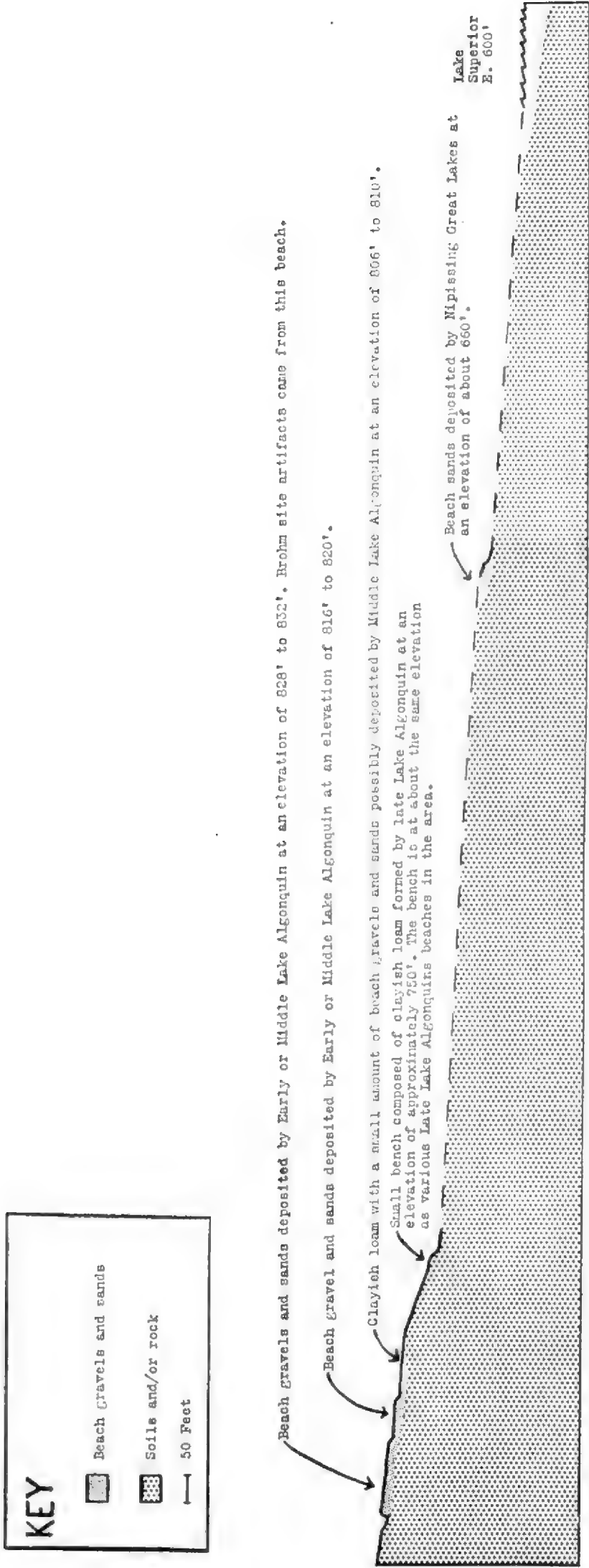


Figure 2. East-west cross-section from Brohm site to Lake Superior.

Mr. Brohm had ploughed in a southwesterly direction along the side of the slope down toward Lake Superior, and extinct beaches were readily apparent. The beaches and the types of artifacts certainly seemed to warrant excavation of the site.

After preliminary arrangements had been made in the local Danish community for room, board, and local labour, a one-foot contour map was made of the general area in which the artifacts had been found. Next, a grid of five-foot squares with one axis of the grid running from south to north magnetic was laid out in an uncleared area just northeast of the ploughed field. The distribution of taconite chips and artifacts in the ploughed field and road was noted on the contoured map (Figure 1). The uncleared area just northeast of the ploughed field seemed to be nearest the area of greatest artifact density on the basis of surface finds, and the artifacts found in the excavation of twenty-two 5-foot squares tended to confirm such a conclusion. Furthermore, two areas, one just west of the southern edge of the distribution of artifacts in the ploughed field and one just northwest of the northernmost distribution of artifacts along the road yielded practically no artifacts or chips (Figure 1).

The stratigraphy of the excavations was relatively simple (Plate II, No. 3). In almost all the squares dug, a humus layer about 6 inches thick overlay a layer of beach pebbles and sand which contained artifacts or chips in the uppermost 9 inches. At about a 1-foot depth, small lenses of waterlaid clays were interspersed in the beach gravels. One square, dug to a depth of 3 feet, revealed that the thickness and number of clay lenses increased as one dug down, there being thicker lenses of clay than lenses of gravel or sand at a depth of 3 feet. In one small area in the centre of the main excavation there was an additional humus layer over a redeposited zone of sandy clay over the lower humus layer mentioned above. This lower humus was in turn over the beach gravels and artifacts.

The stratigraphy of the excavations is significant in that the artifacts are definitely in the beach gravels and under the humus (Plate II, No. 3). This would indicate that artifacts were deposited either near the end of the period of the deposition of beach gravels or somewhat after the period of the deposition of beach gravels but definitely before the building up of the double humus or the single humus.

Any determination of the age of the deposit of beach gravels necessitates a study of the recent geology of the site. Fortunately, Dr. T. L. Tanton of the Geological Survey of Canada had conducted an intensive study of the geology of the Fort William, Port Arthur, and Thunder Cape region, the results of which are particularly applicable to the geology of the area of the Brohm site.¹

The Brohm site is located on a 100-foot wide beach running roughly north-northeast between 826 and 832 feet above sea-level. Directly below it, to the southwest, at a slightly lower elevation (816 to 820 feet) is a narrower beach (Figures 1 and 2). In front of this beach to the southwest and stepped down about 5 feet is a very gradually sloping terrace (from 800 to 810 feet) about 100 feet wide (Plate II, No. 2). The surface soil of this flattened surface is mainly clayish loam with very little sand or beach gravel. This contrasts with the surface of the two nearby higher

¹ T. L. Tanton, 1931, pp. 79-83.

beaches which are covered by small, disk-shaped, waterworn beach pebbles and sand. Farther to the southwest and down a slope, at an elevation of about 750 feet above sea-level, is a small bench with a clayish loam surface. The bench at the same elevation runs a considerable distance north and south along the side of the hill. Below this bench, southwest from the site, the land gradually slopes toward Lake Superior; it has not been cleared 200 yards southwest of the bench. However, for the sake of obtaining a better picture of the topography of the area, a brief excursion was made from the edge of the ploughed field through the brush and trees down to the edge of Lake Superior. One feature, about 200 yards southwest of the ploughed field, was of interest. It was a sandy beach or terrace (660 feet above sea-level) about 60 feet above the present lake level. This estimated elevation is poor, because it is based upon my sitting on the extinct beach and sighting, through a levelled Brunton compass, at tall trees of an estimated height along the lake shore.

Throughout this area are found numerous conspicuous beaches at an elevation of between 640 and 663 feet above sea-level. In fact, most of the downtown area of Port Arthur is situated on one of these beaches. Taylor identified these beaches at an elevation of 640 to 663 feet as having been formed during the early stages of Nipissing Great Lakes.¹ Dr. Tanton concurs in this opinion² and notes a number of other occurrences of these beaches. He is of the opinion that the beach half a mile southwest of the Brohm site, at an elevation of about 660 feet, was another beach of the Nipissing Great Lakes. The clay-covered bench at an elevation of 750 feet above sea-level southwest of the Brohm site is approximately of the same height as a series of beaches behind the town of Port Arthur and, I believe, is connected with them. These Port Arthur beaches, Dr. Tanton believes, were formed during the late stage of Lake Algonquin.³ A prominent beach or series of beaches between 800 and 835 feet above sea-level is noted by Dr. Tanton on Mount McKay, to the north of Port Arthur at Squaw Bay, and on the tip of Thunder Cape.⁴ Since only one beach, north of Alba Station, is higher (850 feet above sea-level) than these beaches, extending from 800 to 835 feet, Dr. Tanton concludes that they were formed during Early to Middle Lake Algonquin times. Furthermore, he definitely disagrees with Leverett, who noted lake action up to 1,350 feet above sea-level⁵ on Mount McKay, and writes: "The present writer did not identify, in Fort William and Port Arthur map-area, beach deposits higher than 850 feet above sea-level. Differential erosion features occur at several elevations up to 1,350 feet . . ." in the general area of Mount McKay.

The beaches Tanton noted between 800 to 835 feet in the general area certainly seem to be connected with the three topmost beaches at the Brohm site. The beach at an elevation of 832 feet on which the Brohm site is found certainly seems to connect with the most prominent high beach in the region, with a top elevation at 835 feet. The 835-foot beach according to Tanton seems to have been formed by the action of Early or, at the latest, Middle Lake Algonquin times (Figure 2).

¹ F. B. Taylor, *Am. Geo.* Vol. XX, pp. 114, 1897.

² Tanton, 1931, p. 81.

³ *Op. cit.* p. 81.

⁴ Tanton, 1931, *see* map 197a.

⁵ Leverett, U.S. Geol. Survey, *Prof. Papers* 154a, pp. 51-59, 1929.

Various estimates of the age of Lake Algonquin have been made. Antevs, on the basis of studies of clay varves and an estimate of the age of the cutting of the Niagara gorge, would date the beginning of Lake Algonquin at about 25,000 years ago and its end about 15,000 years ago.¹ Bryan's recalculation of the data Antevs used would date it between 23,000 and 13,000 years ago.² Recent time estimates, based on Carbon 14 analysis, would date the lake between 10,000 and 5,000 years ago.³

In conclusion it may be said that the geological data concerning the age of the beach on which the Brohm site was found indicate definitely only that the artifacts can not be older than Early Lake Algonquin times. The time involved between the deposition of the artifacts on the beach and the subsequent growth of the humus can not be calculated accurately on the basis of the geological investigation of age of the beaches or terraces. This is equally true of any estimate of the age of artifacts on any beaches not covered by other geologically dated strata both of which lack confirmatory evidence from palæontology, pollen analysis, Carbon 14 analysis, or typology of the artifacts.

Since neither carbon nor palæontological materials were found associated with the Brohm site artifacts, it remains to consider the type or kinds of artifacts found at the site to see if such a study can furnish any hints as to the time at which the site was occupied.

At the Brohm site, eighty-two artifacts or fragments of artifacts were found along with hundreds of flakes and chips. Seven of the artifacts were found by the owner of the site on the surface of the ploughed field, fifteen were collected by the author and his workers, nine were uncovered by excavation in the humus, while fifty-one definitely came from below the humus in the top 9 inches of undisturbed beach sand and pebbles. Comparison of the artifacts derived from these four sources shows that all artifacts from the Brohm collection, the surface of the field, and the humus layer can be duplicated in the collection of artifacts from the undisturbed beach gravels. Furthermore, most of the artifacts from all four sources are made from jaspery taconite. Therefore it is fairly safe to conclude that all artifacts found on the site originally came from the undisturbed top portion of the beach gravels and all belong to a single artifact complex.

In describing the artifacts I have divided them into a number of classes based on their supposed functions. Ideally, the artifacts in these classes should be capable of being classified into types on the basis of their temporal or spatial significance. However, comparative data to indicate the temporal and spatial significance of most of the artifacts from the Brohm site are not available. In two cases it was possible to classify some of the artifacts into types (i.e. Plainview points and snub-nosed scrapers). For the most part I have arbitrarily divided the general functional classes into sub-classes which are based on the variation in shapes and other features of the artifacts. The main purpose of the division into sub-classes has been to facilitate their description. The sub-classes are not considered to be artifact types, though some of them might become such, if comparative data warrant it.

¹ Antevs, 1938.

² Bryan, 1941.

³ Arnold and Libby, 1950.

CLASS 1. PROJECTILE POINTS

Three whole projectile points, eleven basal fragments, three blade fragments, and four unfinished blade fragments appear to belong to a class of artifacts that could have functioned as projectile points. Only the three whole points, the eleven basal fragments, and one blade fragment can be classified.

Plainview Type of Projectile Points

Six (or possibly seven) of the artifacts classified as projectile points fall within the range of Plainview Points.¹ Each of these points from the Brohm site has some unique features and variations from a norm (as do those from the Plainview site in west Texas). They will therefore be discussed more or less individually and compared with similar points from the Plainview site of Texas.

One whole point from the Brohm collection (Plate III, No. 3) is extremely similar to two of the Plainview site specimens, Plate IV, No. 1 (Cat. No. 725-10) and Plate V, No. 3 (Cat. No. 725-8).² In length the Brohm site specimen is 71 mm. long, while the similar Plainview site specimens are 71 mm. and 73 mm. long. All three of these points have their maximum width at the base. The Brohm site specimen is 23 mm. wide at its base, while the two from Plainview are 22 mm. and 23 mm. wide. The approximate length of the tip of the Brohm site specimen, 30 mm., is very similar to the two at Plainview, which are 27 mm. and 28 mm. long. In maximum thickness the three are about the same; the Brohm site specimen being 7 mm. and the two from Plainview are both 6.5 mm. thick. The concavity of their bases is similar; the Brohm site point has a concavity 2 mm. deep, while the two from Plainview are 3.5 mm. and 2 mm. deep. Thus, in general form, size, and dimensions the Brohm site specimen is almost identical with two from the Plainview site. The chipping of the Brohm site specimen shows crude oblique ripple flaking on the lower third on both blade surfaces, while on one surface it has rough collateral chipping on the upper two-thirds. Specimen 725-10 (Plate IV, No. 1) from the Plainview site is almost the same in respect to its chipping, while specimen 725-8 (Plate V, No. 3) differs slightly in that faint collateral chipping appears on one side only. Grinding of the edges of the point extends about 30 mm. up from the base on the Brohm point under discussion. This is about equal to that on most Plainview points. Two other fragmentary specimens from the Brohm site, one a small fragment of a base in the Brohm collection (not illustrated) and the other a basal fragment on which a new point has been worked (Plate III, No. 4), from the beach gravels, seem to have roughly the same dimensions and other features as the points described above. It is also true that at least two more of the Plainview site specimens (Nos. 725-23 and 725-4) are very similar to those described above.³

Two specimens from the Brohm site, one a fragment of taconite picked up in the ploughed field (Plate III, No. 2) and the other a heavily patinated complete point of grey chert which was found in the excavation of the beach gravels (Plate III, No. 1) at a depth of 7 inches below the

¹ Krieger, 1947.

² Krieger, 1947, Table 4.

³ Krieger, 1947, p. 943, or Plate III, No. 2 and Plate III, No. 3.

humus, have a slightly different form and dimensions. They have deep concave bases and excurvate sides with the widest part of the point near the midpoint. The complete point from the gravels is extremely similar to one from the Plainview site (725-2, Plate V, No. 1).¹ The complete projectile point from the Brohm site has a bevelled point like the one (725-2) from the Plainview site, and both have grinding half-way up from the base along the edges. The dimensions of the points are fairly similar, the Brohm site specimen being 68 mm. long, 24 mm. wide at the widest point, 21 mm. wide at the base, 7 mm. thick, with a basal concavity 3 mm. deep, while the Plainview specimen (725-2) is 67 mm. long, 25 mm. wide at the widest point, 24 mm. wide at the base, 6 mm. thick with a base concavity of 2 mm. The crude oblique ripple flaking of the Brohm site specimens is slightly different from this Plainview site specimen (725-2), though rather like that found on another Plainview specimen (725-10). The oblique ripple flaking and the general dimensions of the Brohm site points make them appear rather similar to those from Brown's Valley, Minnesota, though the latter have finer ripple flaking and are slightly broader.²

One large fragmentary Brohm site specimen (Plate III, No. 5) from the beach gravels is somewhat different from those described above. It, however, is very similar to a somewhat aberrant point from Plainview (Plate VI, No. 1, No. 725-5).³ Both points have a very shallow concave base (1 mm. in depth). The bases are narrower than the midpoint on the body, and the narrowest part of the points is just above the base, between the midpoint and the base. In dimension the Plainview specimen (No. 725-50) is 69 mm. long, 24 mm. wide at the base, 26 mm. wide at its widest part, 22 mm. wide at its narrowest part, and 6 mm. thick, while the Brohm site specimen is over 59 mm. long (probably about 75 to 80 mm. long), 22 mm. wide at the base, 25 mm. wide at its widest point, 21 mm. wide at its narrowest point, and 7 mm. thick. On this Brohm site specimen there is fairly good collateral chipping on both surfaces but little grinding along its edges, while this Plainview specimen displays very poor irregular collateral chipping on its surfaces but good grinding along its edges.

The seventh fragmentary point from the gravels of the Brohm site is similar to the others described above. However, it is extremely crude with the basal concavity rudely done, the body rather thick, and the chipping on the surface irregular. The point is also wider at the base than the other specimens described (31 mm.), and the maximum width appears to have been near the mid-point. Whether this fragment is a sport, an unfinished point, a variant of the Plainview type, or another type is difficult to say.

In conclusion, it appears that the largest single group of Brohm site points is almost the same as those found at the Plainview site in west Texas. Krieger has adequately indicated the distribution of points suggestive of the Plainview points from Alaska to Texas, so it is unnecessary to repeat his data.⁴ However, I might add that recent excavations, particularly in the Missouri Valley, have revealed Plainview points at a large

¹ Krieger, 1947

² Jenks, 1937.

³ Krieger, 1947.

⁴ Krieger, 1947, Table 6.

number of sites. A few of the more important sites would be Ft. 41, Ft. 42, and Ft. 50 at Lime Creek, Nebraska, and the components of the Hot Springs Focus in South Dakota.

The general form of the points and the collateral and oblique ripple flaking are suggestive of possible relationship with San Jon, Yuma, Brown's Valley, and Long points. However, considerably more data are necessary before these similarities can be interpreted accurately.

Sub-class: Large Triangular Points (Plate III, Nos. 7 and 8)

Two points of this sub-class were present at the Brohm site. One is in the collection of Mr. Brohm (Plate III, No. 7) while the other (with its point broken) was uncovered in the gravels during excavation (Plate III, No. 8). Both have straight bases; the bases are the widest part of the point (22 and 24 mm. wide); the sides are straight or very slightly excurvate, and the points are long and tapering. Neither has grinding along its edges, but both have rather bevelled points. The fragmentary point found in the beach gravel has crude ripple flaking above the base on both surfaces, whereas the point Mr. Brohm picked up while ploughing his field has irregular chipping. The specimen 7552 from Ft. 50, Lime Creek, Nebraska,¹ is very similar to the Brohm site specimen found in excavation, as are some of those present in the Hot Springs Focus of South Dakota.²

Sub-class: Long Round-based Points with Oblique Flaking
(Plate III, Nos. 9 and 10)

Two small parts of bases and two sections of blades were found in the excavation of the gravels, while a large section of blade and a section of blade with its base were picked in the ploughed field by Mr. Brohm. No specimens show basal grinding along their edges. The widest part of all these blades seems to be at about the midpoint. The nearly complete specimen from the Brohm collection (Plate III, No. 10) is 29 mm. wide at its midpoint. Bases are rounded and tapering and range between 16 and 20 mm. wide. No whole points were uncovered, so total length is unknown, though I suspect all were over 80 mm. long. All the specimens are very thin, being between 4 and 6.5 mm. thick. Some of the points may be asymmetrical.

On three specimens, one small basal part from the excavation and the two from the surface, oblique ripple flaking appears on both surfaces. This is perhaps the most distinctive feature of this sub-class of points.

Analogous points appear to be rare. The projectile point with its point reworked into a drill point from the Long site, Hot Springs Focus, South Dakota, may have originally been similar to this sub-class from the Brohm site as it has a rounded base, is large in size, and has oblique ripple flaking.³

Sub-class: Contracting-stemmed Point(?) (Plate IV, No. 1)

This fragment, found on the surface, is extremely crude and may not represent the basal part of a projectile point. Assuming the fragment is

¹ Schultz and Frankforter, 1948, Figure 7.

² Hughes, 1949.

³ Hughes, 1949, Figure 68t.

part of a point, the widest part would be at its shoulders (30 mm.), and the edges would appear to taper gradually toward a point. The greatest thickness of the point is at the shoulders (14 mm.). The pointed contracting stem is short, being about 18 mm. long. Also, the surfaces of the stem contract from 15 mm. to nothing in 18 mm. The rather flattened base of the stem is about 12 mm. wide.

In general appearance this possible basal fragment of a point is vaguely similar to those found at Gypsum Cave.¹ It is actually thicker than Gypsum Cave points, but not so wide or so finely chipped. The reconstructed form of this Brohm site point is perhaps more similar to pointed stemmed or corner removed projectile points uncovered in the earliest horizons near the east coast, such as those at Tadoussac, Quebec,² from sites near Hopedale, Labrador,³ and from the earliest levels of the Maud Eaton, Seth Swamp, Pringle, and Foster's Cove sites in Eastern Massachusetts.⁴

CLASS 2: CHIPPED DRILL (Plate IV, No. 4)

One basal fragment of what is usually called a drill was dug from the beach gravels, 4 inches below the humus. Actually, objects such as this, usually called drills, have been found embedded in skulls, so there is the possibility of their being projectile points.⁵

The fragment has a rounded, slightly expanded, blunted base, and the maximum width is just above the base (11.5 mm.). The edges are almost straight and taper very gradually toward a point. The maximum thickness of the body is about 6 mm. Both surfaces of the drill are somewhat ridged and bear irregular chipping. The edges bear evidence of retouching, and the base has either been ground or blunted by percussion.

Drills similar in form to this are to be found in many eastern "archaic" sites and in Woodland sites.⁶ Moreover, drills similar in form, though often with a large expanded base, are found in the Hot Springs Focus, in South Dakota⁷ and Ft. 41, Ft. 42, and Ft. 50, at Lime Creek, Nebraska.⁸

CLASS 3: STRIKE-A-LIGHT (Plate IV, No. 2)

One object of taconite roughly triangular in outline was found in the beach gravels. It is about 26 mm. wide near its base and 60 mm. long. Both surfaces of this implement bear marks indicating re-chipping, though one side is almost flat while the other is more convex. Superficially the implement looks like some sort of scraper, but it is entirely lacking any sort of retouching along its edges. The only part of the implement that has been reworked is the wide basal portion. This end appears to have been definitely battered and appears to have pecked something or been pecked by something. The only analogous implements I am familiar with come from the Owasco horizon in New York State, and here Dr. Ritchie has called them strike-a-lights.⁹

¹ M. R. Harrington, 1933.

² Wintemberg, 1945.

³ W. D. Strong, 1930.

⁴ R. P. Bullen, 1949.

⁵ Handbook of the American Indian, B.A.E., B.30, p. 90, 1907 (F. W. Hodge, editor).

⁶ Webb, 1946.

⁷ Hughes, 1949.

⁸ Schultz and Frankforter, 1948.

⁹ Ritchie, 1940.

CLASS 4: BIG BLADES (*knives or daggers*)

Large blades that may have been used as knives or daggers were the most numerous artifacts found at the Brohm site. Twenty-four fragments were uncovered. Relationships of this general class or sub-class are of a most general nature.

For descriptive purposes I have divided the large blades into three sub-classes: square-based blades, ovoid blades, and pick-like blades.

Sub-class: Square-based Blades (Plate IV, Nos. 5-7)

Six fragments of large blades with squared bases occurred at the Brohm site. Four were in the beach gravels, while two were collected by Mr. Brohm in the ploughed field. All specimens are made of jaspery taconite.

The largest of the blades is 162 mm. long, has a maximum width of 85 mm. and a maximum thickness of 18 mm. The flat straight base is 56 mm. wide. The sides are slightly excurvate with a wide notch on one corner about 10 mm. wide and extending up about 40 mm. from the base. This single notch on one side gives the blade a superficial resemblance to Soluteran points and some Sandia points.¹

Other specimens of this sub-class do not have this distinctive one-sided stem and are smaller in size. The smallest one of this sub-class is about 95 mm. long, has a maximum width of 40 mm., is about 8 mm. thick, and has a straight base about 30 mm. wide. All the blades range in size between the two extremes described above.

Blades of these general dimensions and shape are found at Killarney, Ontario, at Brown's Valley, Minnesota,² at various components of the Archaic³ early sites at Lime Creek,⁴ Nebraska, and at the Hot Springs Focus in South Dakota.⁵

Sub-class: Ovoid Blades (Plate V, Nos. 1 and 2)

Sixteen fragments of ovoid blades were uncovered. Eleven were made from jaspery taconite, one from chert, while four were manufactured from fine-grained quartzite. The largest of these is 94 mm. long, 47 mm. wide, and about 12 mm. thick; while the smallest is 71 mm. long, 42 mm. wide, and 8 mm. thick. Sides are excurvate and taper to a long point, while bases vary between being almost pointed and round. Chipping is usually poorly done. Blades of this general description have a wide distribution in time and space.

Sub-class: Pick-like Blades (Plate V, No. 3)

Two fragments of gradually tapering points almost as thick as they are wide were found in the excavation of the beach gravels. The bases of both points are missing. One fragment is 65 mm. long, 36 mm. wide, and has a maximum thickness of 22 mm. The other is 88 mm. long, 47 mm. wide, and has a maximum thickness of about 16 mm. Chipping on the

¹ Hibben, 1941.

² Jenks, 1937.

³ Webb, 1946.

⁴ Schultz and Frankforter, 1948.

⁵ Hughes, 1949.

surface is irregular, but both points bear fine retouching. There is the possibility that both fragments are parts of unfinished ovoid or square-based knives.

Similar pick-like blades, though usually of longer size, are found at Killarney, Ontario,¹ and at Tadoussac, Quebec.²

CLASS 5: SCRAPERS

Nineteen fragments of implements that may have been used to scrape skins were found. All are made from jaspery taconite. Only two came from the surface, while the rest were found in the beach gravels.

Type: Fan-shaped Snub-nosed End Scrapers (Plate VI, No. 2). One of these was found 11 inches below the surface and 7 inches below the top of the beach gravels and sand. It has a maximum length of 55 mm., a maximum width of 66 mm., and a maximum thickness of 12 mm. Its scraping edge, indicated by fine retouching, is roughly 76 mm. long and convex. One surface is almost flat, bearing no flake scars; while the other (the top surface) is excurvate and irregularly chipped.

The other fan-shaped snub-nosed end scraper has roughly the same shape and dimensions. It, however, is made from quartzite and was found on the surface.

In size, shape, and dimensions these two end scrapers are almost identical with those found at the Plainview site³ and at the Folsom site at Lindenmeier, Colorado.⁴ Similar end scrapers are found in the assemblages of various other cultural manifestations in the plains and elsewhere.

Sub-class: Oblong Concavo-convex End Scrapers with Oblique Ripple Flaking (Plate VI, No. 1)

One fragment of quartzite and one whole scraper of taconite of this sub-class occurred in the beach gravels. The whole specimen is 59 mm. long and 40 mm. wide and has a maximum thickness of about 8 mm. The ventral side of the scraper is concave and smooth with no flaking marks, while the dorsal surface is convex and bears fine oblique ripple flakes across it. One of the shorter sides is roughly straight, sloping from the dorsal to ventral side abruptly, and bears fine retouching, while the other short side is more ovoid and the dorsal side tapers gradually toward the ventral side. The two longer sides are very slightly excurvate. The other small fragment of the cutting end seems to be roughly similar. This sub-class of scrapers is unlike any reported in the literature on early man in America and may well represent a distinct type. Only one scraper illustrated for the Allen site (Ft. 50) seems even similar.⁵

Sub-class: Large Irregular Plano-convex Side Scrapers (Plate VI, Nos. 3 and 6)

Three large irregular plano-convex scrapers were taken from the beach gravels, while a fourth was picked up by one of my workers in the ploughed field adjacent to our excavations. All are made from jaspery

¹ Greenman, 1943.

² Wintemberg, 1943.

³ Krieger, 1947.

⁴ Roberts, 1935.

⁵ Schultz and Frankforter, 1948. Figure 13, No. 7579.

taconite. They are rather difficult to describe as a group since each has a different shape and size. Generally they are made from nodules of taconite that were broken in half; all have one irregular convex surface and a flat or slightly convex opposite surface, and all have retouching along the dorsal edge or edges.

Sub-class: Flake Scrapers or Flake Knives (Plate VI, Nos. 4 and 5)

Eleven retouched taconite flakes came from the beach gravels. These, I believe, were used for cutting and scraping skins, though many flakes with no retouching might have served just as well as these. There is a general tendency for the flakes to be ovoid in shape with one side flat and the other very slightly convex. Retouching may occur at the shorter sides or end of the flake (three specimens), along one of the convex longer sides (six specimens), along one of the concave longer sides (one specimen), or along both the end and side of the flake (one specimen). Similar flake scrapers are of a widespread occurrence in the New World.

CLASS 6: BIFACED CHOPPERS

Five long implements with irregular chipping on both surfaces and occasional retouching along a portion of an edge may have been used as choppers (though they superficially appear to be cores). Four came from the ploughed field and one from the excavations. All are made from taconite.

Sub-class: Pointed Choppers or Pick-like Choppers (Plate V, No. 6)

Two implements that superficially look like "coups-de-poing" were found in the field. Both are roughly tear-drop shaped in outline and have irregular chipping on both surfaces. The complete fragment is 128 mm. long and has a maximum width of 68 mm. and a maximum thickness of about 30 mm. The pointed end of this complete fragment has retouching on it adjacent to the point on the tapering sides.

Sub-class: Ovoid Choppers (Plate V, No. 5)

These three implements are roughly ovoid in shape (between 58 and 82 mm. long, 45 and 66 mm. wide, and from 12 to 30 mm. thick). Both surfaces have been rudely chipped, and there is fine retouching along one of the longer edges.

CLASS 7: HAMMERSTONES

One large elliptical pebble about 120 mm. long was found on the surface of the site. Small pits, possibly representing pecking scars, are found on one end of it.

CLASS 8: ABRADING STONE

One small piece of sandstone found in the excavation had a worn groove in it that might have been caused by abrading. It was uncovered in the beach pebbles.

Besides the whole or identifiable artifacts described above, sixteen fragments of unfinished or at least unidentifiable artifacts occurred. Five of these appear to be small enough to have been parts of projectile points, while the others may have been fragments from big blades. Over one thousand chips, cores, or fragments of taconite were uncovered in excavation. Three fragments of patinated grey chert, three pieces of quartz, one chip of black chert, and six chipped quartzite fragments also occurred. The taconite undoubtedly came from the local outcroppings on the Thunder Cap Peninsula. One outcropping is about half a mile from the site. The source of the other material, chipped at the site, is not known, but I suspect that it was obtained from glacial pebbles.

Any comparison between the artifact assemblage from the Brohm site and other sites faces two very serious difficulties. First, pre-pottery or non-pottery complexes have not been found, or at least have not been described, in a wide area surrounding the Brohm site on the northwest shore of Lake Superior. Secondly, the total number of artifacts and the number of classes, sub-classes, or types of artifacts found at the Brohm site and at most of the comparable sites is at best very small. Thus any conclusions or even hypotheses derived from comparative studies are tentative.

In considering this Thunder Bay site's artifact assemblage comparatively, the most important type seems to be the Plainview points. Six of these from the Brohm site have been shown to be very similar to those found at the Plainview site. Their similarity is certainly sufficient to negate the possibility of independent invention or chance manufacture of a similar type of point and is strongly suggestive of some sort of genetic connection. This suggestion of connection between the Brohm and Plainview sites is further strengthened by the fact that all the other kinds of artifacts (fan-shaped snub-nosed scrapers, flake scrapers or knives, and plano-convex side scrapers) from the Plainview site can be duplicated at the Brohm site.¹

However, since the Plainview site (a buffalo "kill") lacks many kinds of artifacts found at the Brohm site (a camp or workshop), the suggestion of a genetic connection is not conclusive. Therefore, I have attempted to make a comparison of the Brohm site artifacts with geographically closer sites having larger artifact assemblages and Plainview (or Plainview-like) points.

Specifically I have compared in Table I the Brohm and Plainview sites with Ft. 41² and Ft. 50 (the Allen site)³ from Lime Creek of Nebraska, and with the Hot Springs Focus in the Angustura Dam basin (mainly the Long site) in South Dakota.⁴ The comparison is rather unsatisfactory in that I have never examined the actual specimens from these sites and have been dependent upon preliminary reports (written and verbal) on the materials from these complexes.

The Brohm, Allen, Long, and Ft. 41 sites appear to have nine specific kinds of artifacts in common, out of a total of twenty-three kinds held by all the sites (Table I). Four of these nine artifacts, which appear to be

¹ Krieger, 1947.

² Schultz and Frankforter, 1945.

³ Holder and Wike, 1949.

⁴ Hughes, 1949.

significant, are: Plainview points, fan-shaped end scrapers, expanding based flint drills, and square-based large blades. Ovoid blades, plano-convex side scrapers, flake side scrapers, abrading stones, and pebble hammerstones appear to be less suggestive of a genetic connection since they are of such a general nature. It is perhaps significant from the standpoint of the Brohm site that thirteen of its sixteen traits occur at two or more of these other sites and that three traits unique to the Brohm site are doubtful, poorly represented traits. I might add that of the twenty-three traits, seventeen occur at two or more of the sites compared.

Rather than attempt to make any general statement concerning relationships based on the comparison of only these five artifact assemblages, I shall use these data to interpret the materials found at the Brohm site. There appear to be four possible interpretations of the Brohm site artifact complex in the light of the previous comparisons. There is, of course, the possibility that all five assemblages (particularly Brohm and Plainview) represent a single artifact complex, and the difference between them is due to inadequate samples of the artifacts from each site. A second possibility is that each of the five is a regional variant of, and derivative from, a general cultural complex of an early temporal horizon in the Eastern Plains and the edge of the Woodlands. Thirdly, it may be that the Brohm site is a late derivative from some Plainview-like complex that has moved eastward out of the Plains into the Eastern Woodlands. Finally, it may be that the similarities of the Brohm site artifacts to the other complexes are due to trade or diffusion of isolated traits. Quite frankly, the fact that the Brohm site artifacts are made from local materials and the fact that thirteen out of sixteen kinds of artifacts found at the Brohm site are found in the other complexes, makes the possibility of the Brohm site similarities being due to trade or diffusion a fairly remote one. Also, the possibility that the Brohm site represents a later derivative of Plainview is not very probable since one must assume that the four kinds of artifacts of the Plainview site continued to be made down through time with practically no variation in form or function. The first two possibilities seem far more likely on the basis of the evidence available at the present time.

Turning now to the age of Plainview points and their associated artifacts, one finds that they were in deposits with *Equus* sp. (horse), *Parelephus columbi* (elephant), and *Bison taylori* at Plainview, Texas. The strata and their artifacts have been considered to be late Pleistocene in age.¹ The two sites from Lime Creek (Ft. 41 and Ft. 50) also were found associated with a late Pleistocene fauna.² The Hot Springs Focus has been considered to be early Recent in age.³ Krieger has listed eleven other occurrences of the Plainview points associated with fossils or other geological phenomena indicative of late Pleistocene times.⁴ Thus, typologically, Plainview points and associated artifacts often appear to be late Pleistocene or very early Recent in age. Therefore, typologically, the artifacts from the Brohm site seem early.

The geological evidence from the Brohm site revealed that the artifacts were associated with an early to middle Lake Algonquin beach and had

¹ Sellards, Evans, and Meade, 1947, pp. 936-938.

² Schultz, Sueninghoener, and Frankforter, 1948, p. 37.

³ Hughes, 1949, p. 271.

⁴ Krieger, 1947, Table 3.

been deposited before the humus had begun to form there. One can definitely state that the Brohm site artifacts cannot be earlier than early Lake Algonquin times. The exact interval between the formation of the Early to Middle Lake Algonquin beach and the deposition of the humus (i.e. the interval of deposition of the Brohm site artifacts) cannot be accurately determined by geologists. However, in light of the age of the Plainview points and associated artifacts elsewhere, unless the Brohm site artifacts represent a cultural lag (which, as I have indicated, is only a remote possibility), I believe that tentatively the Brohm site can be considered to have been occupied during Middle or Late Lake Algonquin times or shortly thereafter. Future work in the Thunder Bay district could do much toward confirming or refuting this tentative determination of age.

In summary there is evidence that a group of people occupied and used as a workshop an Early to Middle Lake Algonquin beach on the Brohm farm near Pass Lake, Thunder Bay district, Ontario. Eighty-two artifacts of this group have been found and indicate that the Brohm site people were related to other early groups occupying at least part of the region from South Dakota to Texas. The Brohm site people seem to have been living along or close to the shore of a late Pleistocene Lake (3,000 to 9,000 years ago), ancestral to Lake Superior (called Lake Algonquin), which had its surface between 175 to 220 feet above the present lake.

Table I. Comparisons with the Brohm Site Artifact Complex

	Brohm	Hot Springs	Ft. 41	Allen (Ft. 50)	Plainview
Plainview points.....	7	×	×	×	18
Fan-shaped end scrapers.....	2	×	×	12	2
Flake side scrapers or knives.....	11	×	×	?	×
Large plano-convex scrapers.....	3	×	×	-	×
Square-based big blades.....	6	×	7+	13	-
Ovoid blades.....	16	×	×	4	-
Flint drills.....	1	×	×	×	-
Pebble hammerstones.....	1	×	×	×	-
Abrading stones.....	1	×	×	×	-
Triangular points.....	2	×	1	-	-
Round-based oblique chipped points.....	4	×	-	-	-
Oblong concavo-convex end scrapers.....	2	-	-	×	-
Choppers (thick biface).....	5	-	×	-	-
Pick-like blades.....	2	-	-	-	-
Contracting stem points.....	1?	-	-	-	-
Strike-a-light.....	1?	-	-	-	-
Long points.....	-	×	-	×	-
Clear fork gouges.....	-	×	-	×	-
Manos.....	-	×	-	×	-
Metates.....	-	×	-	×	-
Scottsbluff points.....	-	-	×	-	-
Bola stones.....	-	-	-	×	-
Thin trapezoidal end scraper.....	-	-	-	×	-

BIBLIOGRAPHY

- Arnold, J. R., and W. F. Libby: Radio-carbon dates. University of Chicago, Inst. of Nuclear Studies, Chicago, 1950.
- Bullen, R. P.: Excavations in Northeastern Massachusetts. Papers of the Robert S. Peabody Foundation for Archaeology, vol. 1, No. 3, Andover, Mass., 1949.
- Bryan, Kirk and Louis L. Ray: Geological antiquity of the Lindenmeier site in Colorado. Smithsonian Misc. Coll., vol. 99, No. 2, Washington, D.C., 1941.
- Greenman, E. F.: An early industry near Killarney, Ontario. Am. Antiquity, vol. VIII, No. 3, Menasha, Wisc., 1943.
- Harrington, M. R.: Gypsum Cave, Nevada. Southwest Mus. Pap., No. 8, Los Angeles, 1933.
- Hibben, Frank C.: Evidence of early occupation in Sandia cave, New Mexico, and other sites in the Sandia-Manzano Region. Smithsonian Misc. Coll., vol. 99, No. 23, Washington, D.C., 1941.
- Hodge, F. W.: Handbook of American Indians north of Mexico. Bur. of Am. Ethn., Bull. 30, p. 90, Washington, 1907.
- Holder, Preston and Joyce Wike: The frontier culture complex, a preliminary report on a prehistoric hunters' camp in southwestern Nebraska. Am. Ant., vol. XIV, No. 4, Pt. 1, Menasha, Wisc., 1949.
- Hughes, Jack T.: Investigations in western South Dakota and northeastern Wyoming. Am. Ant., vol. XIV, No. 4, Pt. 1, Menasha, Wisc., 1949.
- Jenks, Albert E.: Minnesota's Browns Valley man and associated burial artifacts. Memoirs of the Am. Anthro. Assoc., No. 49, Menasha, Wisc., 1937.
- Krieger, A.: Artifacts from the Plainview Bison Bed. In an article entitled "Fossil Bison and Associated Artifacts from Plainview, Texas" by E. H. Sellard, G. L. Evans, and G. E. Meade. Bull. Geol. Soc. of America, vol. 58, 1947.
- Leverett, Frank: Moraines and shore lines of the Lake Superior region. U.S. Geol. Surv., Prof. Paper 154 A, Washington, D.C., 1929.
- Leverett, Frank and Frank B. Taylor: Pleistocene of Indiana and Michigan and the history of the Great Lakes. U.S. Geol. Surv. monographs, vol. LIII, Washington, D.C., 1915.
- Roberts, Frank H.: A Folsom complex, preliminary report on investigations at the Lindenmeier site in Northern Colorado. Smith. Misc. Coll., vol. 94, No. 4, Washington, D.C., 1935.
- Schultz, G. Bertrand and W. D. Frankforter: Preliminary report on the Lime Creek sites: new evidence of early Man in southwestern Nebraska. Bull. of the Univ. of Nebraska State, Mus. vol. 3, No. 4, Pt. 2, Lincoln, Nebraska, 1948.
- Schultz, G. Bertrand, Gilbert C. Lueninghoener, and W. D. Frankforter: Preliminary geomorphological studies of the Lime Creek area. Bull. Univ. of Nebraska State, Mus. vol. 3, No. 4, Pt. 1, Lincoln, Nebraska, 1948.
- Sellards, E. H., Glen L. Evans, and Grayson E. Meade (with a description of artifacts by Alex D. Krieger): Fossil Bison and associated artifacts from Plainview, Texas. Bull. Geol. Soc. of America, vol. 58, 1947.
- Strong, W. D.: A stone culture from northern Labrador and its relations to Eskimo-like culture of the Northeast. Am. Anthro. vol. 32, No. 1, Menasha, Wisc., 1930.
- Tanton, T. L.: Fort William and Port Arthur, and Thunder Cap map-areas, Thunder Bay district, Ontario. Geol. Surv., Mem. 167, Canada, Dept. of Mines, Ottawa, Ont., 1931.
- Taylor, Frank B.: Notes on the abandoned beaches of the north coast of Lake Superior. Am. Geol., vol. XX, pp. 11-128, 1897.
- Webb, W. S.: Indian Knoll. Univ. of Kentucky Repts. in Anthropology and Archaeology, vol. IV, No. 3, Pt. 1, Lexington, Kentucky, 1946.
- Wintemberg, W. J.: Artifacts from ancient workshop sites near Tadoussac, Saguenay county, Quebec. Am. Antiquity, vol. VIII, No. 4, Menasha, Wisc., 1943.

PLATE II

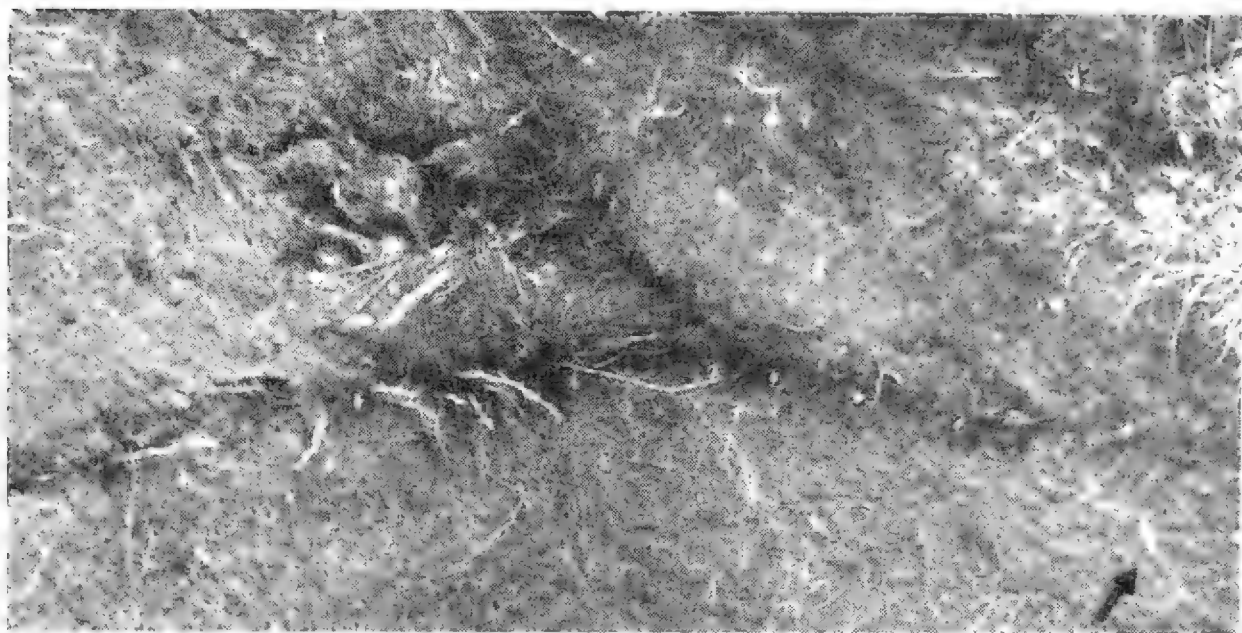
1. Excavation of main trench at the Brohm site in the uncleared area.
2. Standing on the Brohm site looking eastward toward Lake Superior with the 800-foot and 815-foot beach in foreground.
3. Cross-section of the corner of a square at the Brohm site. Note primary humus and roots and fill over second humus which is over the beach gravels. The four-inch arrow is pointing to a fragment of a large ovoid blade in the beach gravels.



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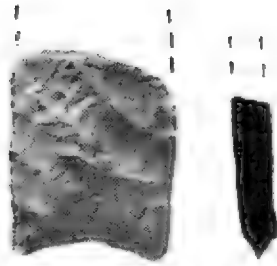
PLATE III

(½ natural size)

1. Plainview point from square S25 E5 uncovered in top 6 inches of the beach gravels (Cat. No., Nat. Mus. of Can. VIII-F-27518). Note the oblique ripple flaking. The point is bevelled.
2. Base of a Plainview point (Cat. No., Nat. Mus. of Can. VIII-F-27509b) from surface collection.
3. Base of a Plainview point from the J. Brohm collection at Pass Lake, Ontario.
4. Fragment of a Plainview point with the point reworked from the surface of the Brohm site (Cat. No., Nat. Mus. of Can. VIII-F-27509a).
5. Fragment of a Plainview point from square S40 E5, found 9 to 16 inches below the surface in the beach gravels. Note the collateral flaking (Cat. No., Nat. Mus. of Can. VIII-F-27528).
6. Fragment of a crude concave-based point from square S50 E5, uncovered in the gravel layer 12 to 18 inches below the surface and 6 to 12 inches below the humus (Cat. No., Nat. Mus. of Can. VIII-F-27538).
7. Large triangular point from Brohm collection at Pass Lake, Ontario.
8. Triangular point with oblique ripple flaking from square S40 E5, discovered 9 to 15 inches below the surface in the beach gravels (Cat. No., Nat. Mus. of Can. VIII-F-27529). Note the bevelled point.
9. Blade with parallel oblique ripple flaking probably part of round-based point from the surface of the Brohm site (Cat. No., Nat. Mus. of Can. VIII-F-27510a).
10. Round-based point with crude oblique ripple flaking from Brohm collection at Pass Lake, Ontario.



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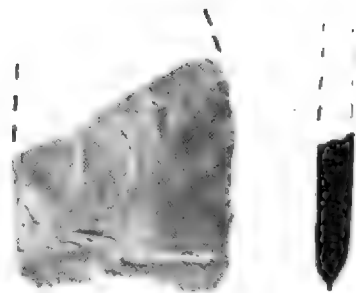
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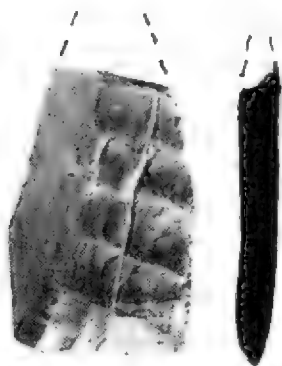
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9



10

PLATE IV

($\frac{1}{2}$ natural size)

1. Possible basal fragment of a crude contracting-stemmed point found in the beach gravels in square S65 E5 (Cat. No., Nat. Mus. of Can. VIII-F-27548).
2. Possible strike-a-light from beach gravels in square S15 E20 (Cat. No., Nat. Mus. of Can. VIII-F-27592b).
3. Unfinished projectile point or scraper from beach gravels in square S15 E20 (Cat. No., Nat. Mus. of Can. VIII-F-27592a).
4. Basal fragment of a chipped drill with a slightly expanded base from the beach gravels in square S20 E15 (Cat. No., Nat. Mus. of Can. VIII-F-27585).
5. Large fragment of a square-based blade from square S30 E10, uncovered in the beach gravels (Cat. No., Nat. Mus. of Can. VIII-F-27570).
6. Large square-based blade in the Brohm collection at Pass Lake, Ontario.
7. Square-based blade fragment in the Brohm collection at Pass Lake, Ontario.



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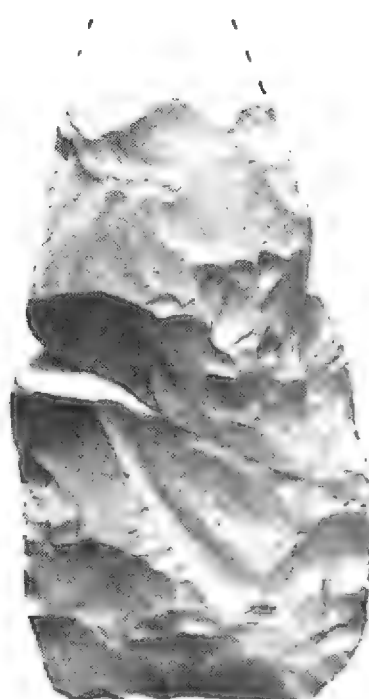
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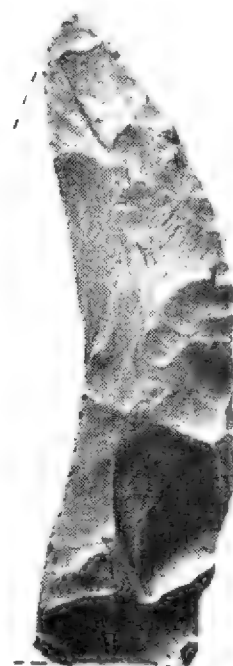
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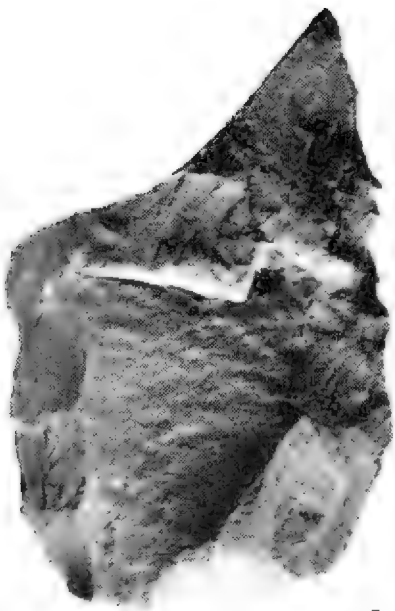


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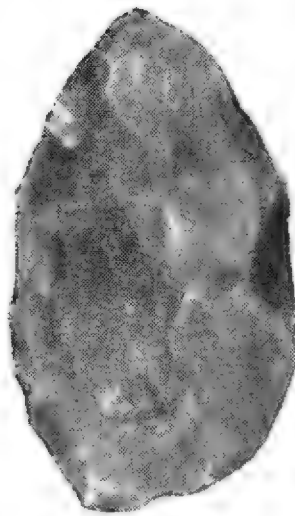
PLATE V

($\frac{1}{2}$ natural size)

1. Ovoid blade fragment from square S40 E10 in the beach level (Cat. No., Nat. Mus. of Can. VIII-F-27579).
2. Ovoid blade in J. Brohm collection at Pass Lake, Ontario.
3. Possible pick point from square S60 E5 at the surface of the beach gravels (Cat. No., Nat. Mus. of Can. VIII-F-27541).
4. Fragment of a chopper or unfinished blade surface of the Brohm site (Cat. No., Nat. Mus. of Can. VIII-F-27511b).
5. Fragment of a chopper from the humus of square S45 E5 (Cat. No., Nat. Mus. of Can. VIII-F-27533).
6. Fragment of a pointed chopper from the surface of the Brohm site (Cat. No., Nat. Mus. of Can. VIII-F-27511a).



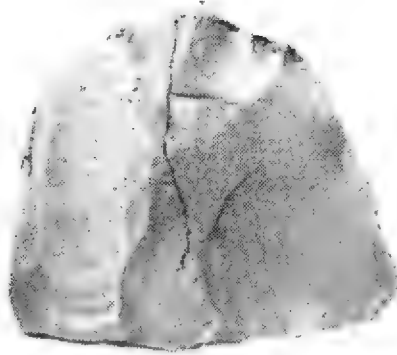
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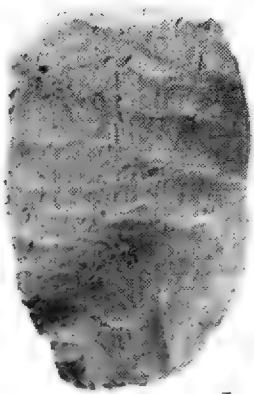
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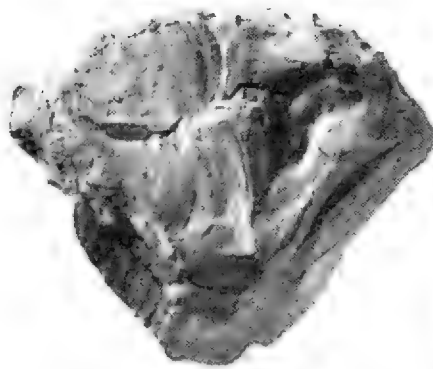
PLATE VI

 $(\frac{1}{2}$ natural size)

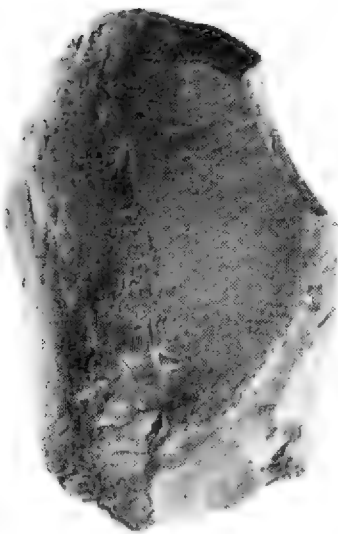
1. Oblong end scraper with ripple flaking on dorsal surface from square S65 E5 in the beach gravels (Cat. No., Nat. Mus. of Can. VIII-F-27549b).
2. Fan-shaped end scraper from square S15 E10, found in a shallow pit 9 inches below the top of beach gravels (Cat. No., Nat. Mus. of Can. VIII-F-27561).
3. Humped-backed end scraper from the beach gravels in square S10 E10 (Cat. No., Nat. Mus. of Can. VIII-F-27557).
4. Flake end scraper from beach gravels of square S65 E5 (Cat. No., Nat. Mus. of Can. VIII-F-27549A).
5. Flake side scraper or knife from humus of square S30 E10 (Cat. No., Nat. Mus. of Can. VIII-F-27568).
6. Large cone scraper from surface of Brohm site (Cat. No., Nat. Mus. of Can. VIII-F-27513).



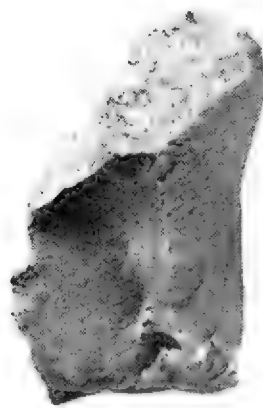
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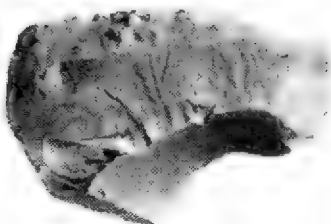
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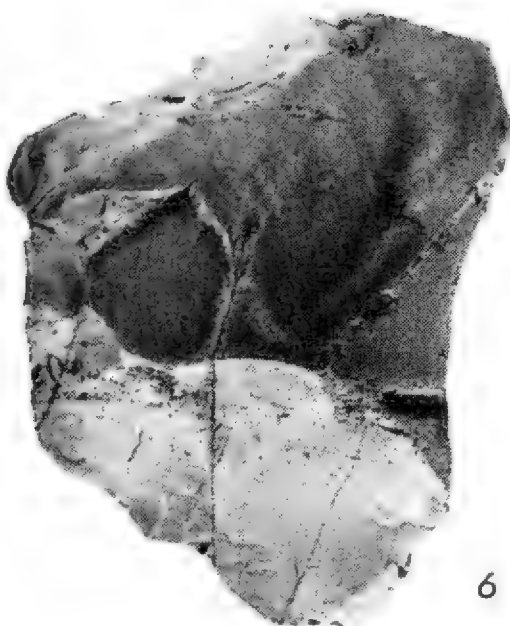
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ARCHÆOLOGICAL EXCAVATIONS AT RESOLUTE, CORNWALLIS ISLAND, N.W.T.

By Henry B. Collins

In the summer of 1950 the writer returned to Resolute, the weather station on Cornwallis Island, to continue archæological excavations begun there in 1949. As in the two preceding summers, the work was sponsored jointly by the National Museum of Canada and the Smithsonian Institution. I was assisted by Mr. William E. Taylor, anthropology student at the University of Toronto. We are indebted to the Royal Canadian Air Force for transportation to and from Resolute, and to the Department of Transport and U.S. Weather Bureau for providing living facilities at the weather station. Mr. Taylor and I left Dorval Airport, Montreal, on July 4, and reached Resolute the next afternoon, after an overnight stop at Churchill.

The four abandoned village sites in the vicinity of the Resolute weather station represent the largest concentration of old Eskimo remains on Cornwallis Island. Eskimo tent rings, cairns, fox traps, and other evidences of temporary occupancy are found at many places along the coasts of the island, but nowhere else are there such numbers of permanent stone and whale bone house ruins. In fact, a Geological Survey party consisting of Dr. Y. O. Fortier, Trevor Harwood, and Ray Thorsteinson, in the first circuit of the island in the summer of 1950, found no permanent house ruins like those around Resolute. Fortunately, these sites are under the protection of the R.C.M.P. and, thanks to their vigilance, should escape the destruction that has been the fate of so many prehistoric sites in other parts of the Arctic, especially in Alaska. Being so near the weather station where living facilities are available, the Resolute ruins can be excavated more easily and more efficiently than similar ruins elsewhere. In view of these circumstances, it was our policy from the beginning to limit our excavations as much as possible and to leave most of the house ruins for future archæologists whose knowledge and techniques may be expected to be better than ours of to-day. Our objective was to obtain a representative sample of material from each site, a sample large enough to show the relationship of one site to another and to reveal a full picture of the culture of each site during the period it was occupied. Consequently, in 1949 we had selected for excavation what appeared to be the latest and two of the oldest of the nine house ruins at the Lake Site, a quarter mile from the station. At the largest of the old sites, M 1, about a mile from the station, we began excavation of what seemed to be the oldest of the twelve large stone and whale bone house ruins (House B) and of two others (Houses L and M) which differed from the others in that no stones or whale bones were visible at the surface. At the nearby site, M 2, where the houses were of the same type as L and M, we excavated one (House A) and part of a rather extensive midden area adjacent to the houses. At the fourth site, M 3, on the south side of Cape Martyr, we had time to dig only one small house ruin.

Our work in the summer of 1950 was for the purpose of completing the excavations begun in 1949 and of making such new excavations as were needed to accomplish the objectives mentioned above. No new excavations were begun at the Lake Site or at M 3. At M 2 excavations were made in the midden and in the entrance area of House A. A small structure, evidently a temporary house site (House I), was also dug at M 2.

Most of the work was done at M 1. One of the most recent-appearing ruins, House C, was excavated completely, except for the inner end of the entrance passage which was still frozen when we left on August 19. Photographs taken before and after excavation are shown on Plate VII, A and B, and Plate VIII, A. The house consisted of a main room, round to squarish in shape, with inner diameters of $8\frac{1}{2}$ and 9 feet, and a smaller circular annex, $6\frac{1}{2}$ feet in diameter, enclosing a sleeping platform (Plate VII, B, background). Another sleeping platform, 9 feet long and 4 feet wide, occupied the rear (north) end of the main room (Plate VII, B, right foreground, and Plate VIII, A, background). The flat stone slabs of the platform were supported by four stone uprights, the spaces between them having been used as storage compartments. Beneath and in front of the platform and along the east wall was a large mass of pure ice, such as was found the summer before in Houses E and I at the Lake Site. This had been formed by snow that had drifted in through the broken roof after the house had been abandoned. The house had not been occupied for very long, for the midden in front contained relatively few artifacts and little refuse, and on the house floor the refuse layer was not more than 2 inches thick. The floor was made of carefully laid flat stone slabs, about 20 inches below the level of the ground outside.

As in the case of the other houses of this type, the walls of House C had been made of stones and turf which formed a high embankment on all sides, making the house seem more deeply excavated than it actually was. In this connection it was found that some of the other houses at M 1 and apparently all of those at the Lake Site had not been excavated at all but had had the stone floor laid directly on the original gravel surface and a high embankment of turf, enclosing the stone and sod walls, built up round it. This situation was shown most clearly at Houses E and I at the Lake Site, where the lowermost sods of the embankment were found to rest on lichen-covered gravel—the original surface—at the same level as the floor stones. Houses of this kind, with their floors at the outside ground level but surrounded by a wide 2- to 4-foot high embankment of sod, were probably as warm and comfortable as the usual form of Eskimo house built partly under ground, if not more so. It was apparently a local form adapted to a particular environment. As the houses were situated on an old beach line of loose gravel—mainly limestone detritus—with a large fresh water pond immediately to the rear, water seepage would probably have occurred if the floors of the houses nearest the pond had been sunk below the surface. To achieve the protection of a permanent “underground” house, it was only necessary, therefore, to

erect a wide sloping embankment of sod round the house walls, with sods cut from the margins of the pond or the deep moss banks at the foot of the old beach line.

In contrast with this type of house were Houses L and M at M 1 (Plate VIII, B), situated on the next lowest or eighth old beach line, 65 yards to the south of the upper houses. There being no nearby water to cause seepage, these houses had their floors excavated to a depth of 2 feet. There were no stone and sod walls and no whale bone roof supports. The gravel removed in excavating the floor had been piled up to form a low ridge round the periphery. This ridge and a few stones piled up in the corners (at House L) had probably supported a domed skin roof, the house walls being the gravel bank itself. To the south was an entrance passage, its floor 16 inches lower than the house floor. These houses, like those at M 2 on the second old beach line, were probably the summer dwellings of the people who occupied the large stone and whale bone houses at M 1 in winter.

In 1949 we had begun excavation of House B at M 1, which appeared to be one of the oldest and largest of the houses at this site. We had removed the surface layer of sod and begun excavation of parts of the midden that extended for more than 30 feet down the slope from the house (Plate IX, A). In 1950 we continued these excavations, both in house and midden, and obtained large quantities of material. The house proved to be of the tri-lobed or clover-leaf shape, with three sleeping rooms opening onto the stone paved central main room (Plate IX, B) and a fourth room opening directly into the passage on the southwest side. The stone platforms in the small rooms were from 5 to 8 feet long, 4 to 5 feet wide, and were raised 15 inches above the floor. Ice masses were found under the north and west platforms. The house floor, 20 inches below outside ground level, consisted of large flat stone slabs neatly fitted together. Two blubber bins, made of flat upright stone slabs, had been set into the floor in front of two whale bone and stone roof supports. The bins were rectangular in shape, 40 inches long and 32 and 20 inches wide. These and two smaller bins on the west and south sides contained masses of blubber in a good state of preservation.

The great accumulation of refuse in House B and the midden below it indicated a long period of occupancy. The house was prolific in artifacts, many of them unbroken. The masses of blubber held in the stone bins meant that food was abundant, and the many usable artifacts found on the floor and especially in the storage compartments beneath the sleeping platforms suggested that the house had not been abandoned intentionally. Among the many objects found in the house were the pouch made of a seal flipper with flap and fastening thong and the necklace amulet shown on Plate XIII, figures 1 and 3. The latter consisted of a carefully stitched tubular band of seal skin, to which were attached five small skin pouches, each probably containing some small object as a charm, and at the centre an unusually large gull head with dried skin

and eye balls still intact. This was probably worn round the neck of the hunter as a whaling charm. It and the seal flipper bag were found together on the floor beside one of the blubber bins. The whaling harpoon head (Plate X, figure 3) was found beneath the north sleeping platform with a number of other artifacts. It is $9\frac{1}{2}$ inches long, the largest such harpoon head known from the central or eastern Arctic.

Other typical artifacts from House B and other localities are illustrated on Plates X to XIII. These are not intended to represent the entire range of types found but were selected mainly to include types that were not illustrated in last year's Annual Report on the 1949 excavations.

As excavation of House B proceeded, a few Dorset implements were found in it and just outside the north wall (Plate XII, figures 1, 2, 7). On the chance that a Dorset site might be found, we sank test pits at various places including a flat area just to the north of Houses B and C where a number of very shallow, gravel-rimmed depressions were visible. Four of these depressions were excavated. Three of them were found to be definite structures and were designated Houses N, O, and P. House O had a clearly defined entrance passage but no stone floor or walls, and it contained only a few animal bones and fragments of artifacts. House N also had an entrance passage but lacked walls and floor. It contained a large number of animal bones, and the artifacts, though few in number, were significant. They were identical with early Thule-Punuk types from Alaska and were therefore older than the other Resolute material. One of the Alaskan type harpoon heads from House N is shown on Plate X, figure 9. Of even greater interest is the broken ivory harpoon head shown on Plate X, figure 4, which has one barb and opposite it an ornamental remnant of a side blade slot. It is thus a transitional form between the two-barbed Thule harpoon head and the Birnirk, the Alaskan type ancestral to the Thule, which had a functional stone side blade set in a slot on the side opposite the barb. On the basis of the artifacts it contained, this small and inconspicuous house ruin is the oldest Thule structure thus far found in the central or eastern Arctic. It was probably occupied briefly, for one or two years, by some of the first Thule migrants from Alaska, who in all likelihood then continued on to Northwest Greenland.

The excavation, which began as Test Pit 4 and was later called House P, contained remnants of a stone floor just below the surface, but other features of the house could not be determined. The floor was probably Thule, for some early Thule-type implements were found around it. Immediately to the west of the floor stones but at a lower level was a small refuse area which seemed to represent an older floor level. It contained a quantity of small bird bones, including skulls, some feathers, seal phalanges, wisps of baleen, wood chips, and a series of artifacts that unquestionably were Dorset. Some of the latter are shown on Plate XII, figures 3 to 6, 8, 9. The situation here seems to follow the now familiar

pattern in the central and eastern Arctic of a Thule house built on a site previously occupied by the Dorset people. It will be necessary to extend the cut on several sides to obtain more information on the structural features of what we have called House P and of the relationship of the Dorset and Thule material found in and around it.

If the few Dorset objects in House P indicate actual occupancy of the site by Dorset Eskimos, then we have three stages of culture represented at Resolute—Dorset, early Thule, and developed Thule. The first two were probably represented by only one or two families who lived there for very short periods. The last stage was of much longer duration, possibly a century or more, during which time the population was probably to be numbered in the hundreds.



A. House C at M 1 before excavation. Looking South.



B. House C at M 1 after excavation. Looking Southwest. Entrance passage to left of marker.



A. House C, M 1, after excavation. Looking North. Sleeping platform in background.



B. House M, M 1, after excavation. Looking Northwest. Sunken entrance passage in foreground.



A. House B, M 1, after removal of surface layer of soil. Looking North.



B. House B, M 1, after excavation.

PLATE X

- Figure 1. Harpoon head, antler, one barb spliced on. M 1, House B, square 14, depth 8 inches.
- Figure 2. Harpoon head, antler. M 1, House B, square 29, depth 20 inches.
- Figure 3. Whaling harpoon head, bone. M 1, House B, square 34, depth 30 inches.
- Figure 4. Harpoon head, ivory. M 1, House N, depth 6 inches.
- Figure 5. Harpoon head, bone. M 1, House B, square 8, depth 12 inches.
- Figure 6. Harpoon head, bone. M 1, House B, square 14, depth 11 inches.
- Figure 7. Harpoon head, bone. M 1, House B, square 28, depth 5 inches.
- Figure 8. Harpoon head, bone. M 1, House B, square 34, depth 30 inches.
- Figure 9. Harpoon head, antler. M 1, House N, depth 4 inches.
- Figure 10. Harpoon blade, slate. M 1, House B, square 34, depth 30 inches.
- Figure 11. Harpoon blade, nephrite. M 1, House B, square 20, depth 12 inches.
- Figure 12. Peg for butt end of dart, bone. M 1, House B, square 37, depth 4 inches.
- Figure 13. Harpoon ice pick, antler. M 1, House B, square 10, depth 12 inches.
- Figure 14. Harpoon socket piece, bone. M 1, House B, square 34, depth 30 inches.
- Figure 15. Harpoon socket piece, antler. M 2, House A, square 24, depth 12 inches.
- Figure 16. Salmon spear prong, bone. M 1, House B, square 31, depth 5 inches.
- Figure 17. Barbed spear prong, bone. M 1, House B, square 21, depth 26 inches.
- Figure 18. Toy arrow, wood. M 1, House B, square 15, depth 24 inches.

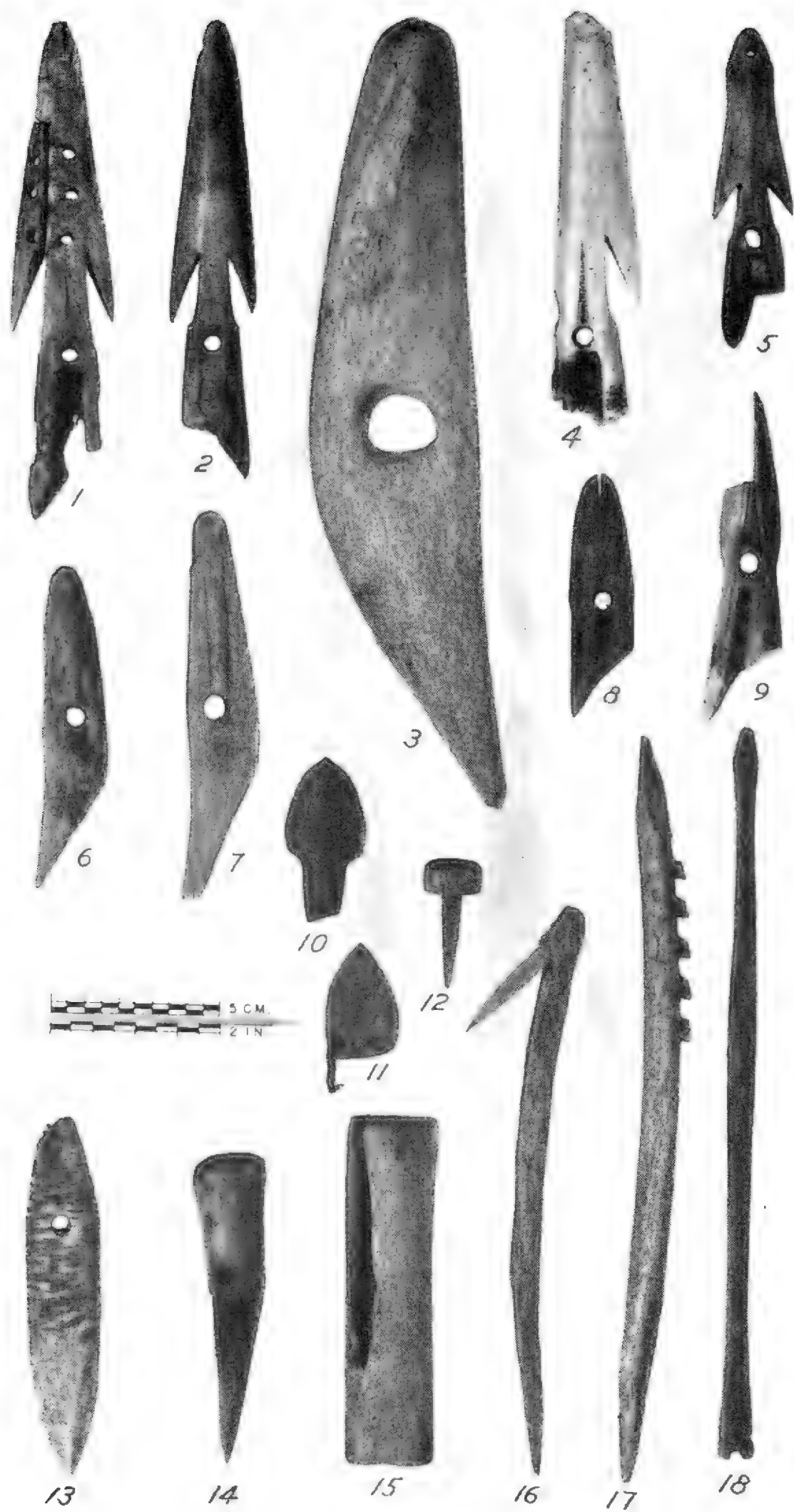


PLATE XI

- Figure 1. Knife handle, bone. M 1, House B, square 20, depth 10 inches.
- Figure 2. Knife handle, bone, composite. M 1, House B, square 33, depth 22 inches.
- Figure 3. Knife blade, nephrite. Lake Site, House I, square 45, depth 15 inches.
- Figure 4. Polar bear tooth. M 1, House B, square 34, depth 10 inches.
- Figure 5. Small ulu handle, antler. M 1, House B, square 34, depth 30 inches.
- Figure 6. Amulet box, wood. M 1, House B, square 20, depth 5 inches.
- Figure 7. Ajagaq, seal humeri, and baleen pin. M 1, House B, square 34, depth 30 inches.
- Figure 8. Stone club, baleen handle. M 1, House B, square 33, depth 18 inches.
- Figure 9. Pail handle, wood. M 1, House B, square 27, depth 13 inches.
- Figure 10. Pottery fragment. M 1, House B, square 44, depth 10 inches.
- Figure 11. Plaited baleen. M 1, House B, square 19, depth 15 inches.
- Figure 12. Plaited baleen. M 1, House B, square 2, depth 12 inches.

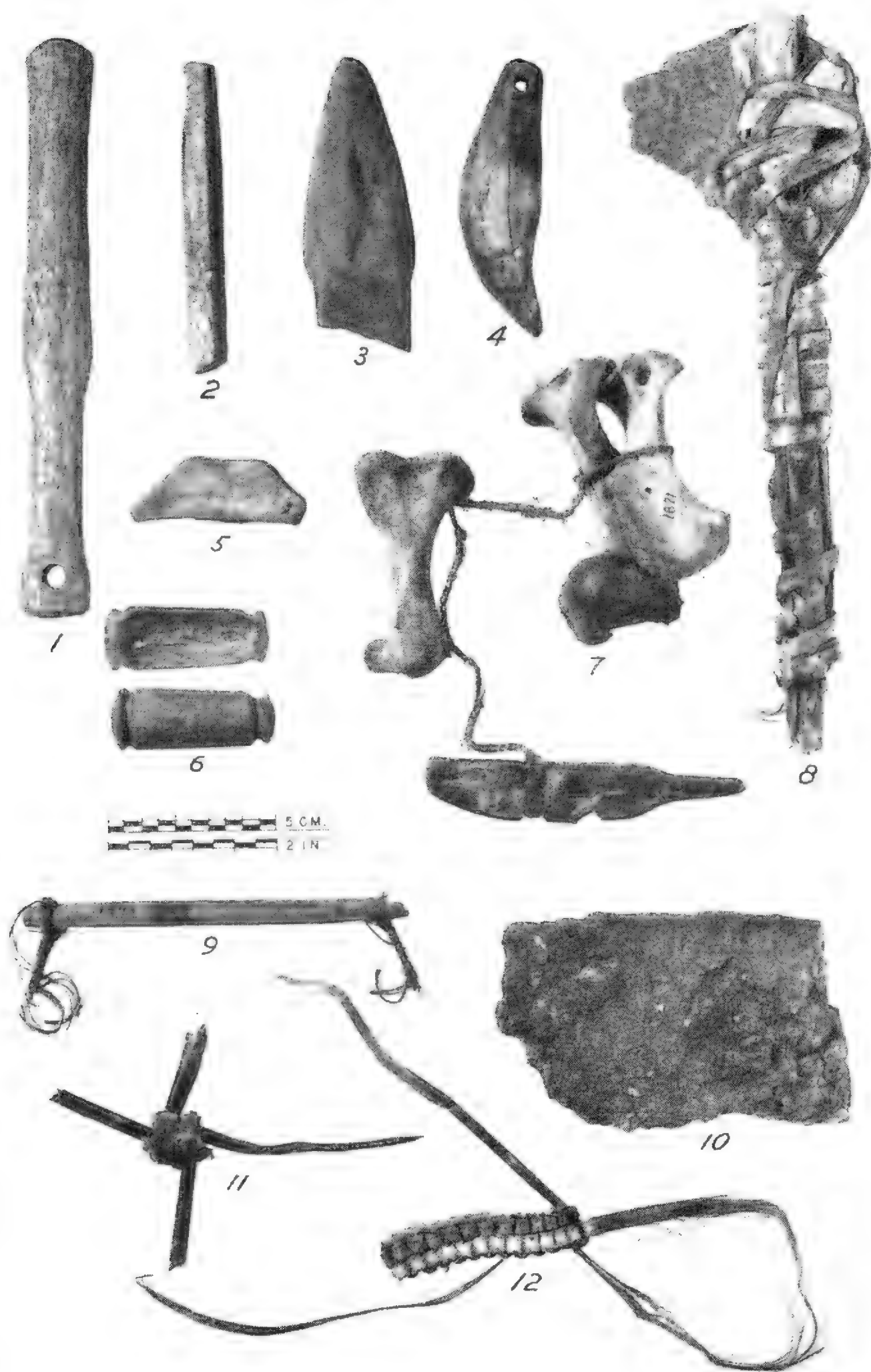


PLATE XII

- Figure 1. Harpoon foreshaft, antler, Dorset. M 1, House B, square 37, depth 7 inches.
- Figure 2. Harpoon head, antler, reworked, Dorset. M 1, House B, square 34, depth 14 inches.
- Figure 3. Knife blade, chert, Dorset. M 1, House P, depth 10 inches.
- Figure 4. Knife blade, chert, Dorset. M 1, House P, depth 10 inches.
- Figure 5. Seal figure, ivory, Dorset. M 1, House P, depth 10 inches.
- Figure 6. Adz blade, nephrite, Dorset. M 1, House P, depth 10 inches.
- Figure 7. Perforated object, antler, Dorset. M 1, House B, square 32, depth 10 inches.
- Figure 8. Bone needle, Dorset. M 1, House P, depth 10 inches.
- Figure 9. Barbed point, antler, Dorset. M 1, House P, depth 10 inches.
- Figure 10. Gull hook shank, wood. M 1, House C, depth 22 inches.
- Figure 11. Gull hook shank, wood. M 1, House B, square 20, depth 14 inches.
- Figure 12. Thimble, seal skin. M 1, House P, depth 10 inches.
- Figure 13. Thimble, seal skin. M 1, House B, square 34, depth 30 inches.
- Figure 14. Toy throwing board, wood. M 1, House B, square 15, depth 12 inches.
- Figure 15. Doll, wood. M 1, House B, square 3, depth 5 inches.
- Figure 16. Doll, wood. M 1, House B, square 25, depth 12 inches.
- Figure 17. Toy sled runner, wood. M 1, House B, square 44, depth 8 inches.
- Figure 18. Ivory chain. Lake Site, House I, square 46, depth 15 inches.
- Figure 19. Bird bone inserted in another. M 1, House B, square 3, depth 8 inches.
- Figure 20. Ivory comb. M 1, Test Pit 3, depth 4 inches.
- Figure 21. Ivory ornament. M 1, House B, square 32, depth 8 inches.
- Figure 22. Seal figure, ivory. M 1, House B, square 29, depth 20 inches.
- Figure 23. Nephrite bead. M 1, House N, depth 10 inches.
- Figure 24. Bird figure, ivory. M 1, House B, square 20, depth 11 inches.
- Figure 25. Piece of mica. M 1, House B, square 33, depth 11 inches.
- Figure 26. Link ornament, ivory. Lake Site, House I, square 45, depth 15 inches.

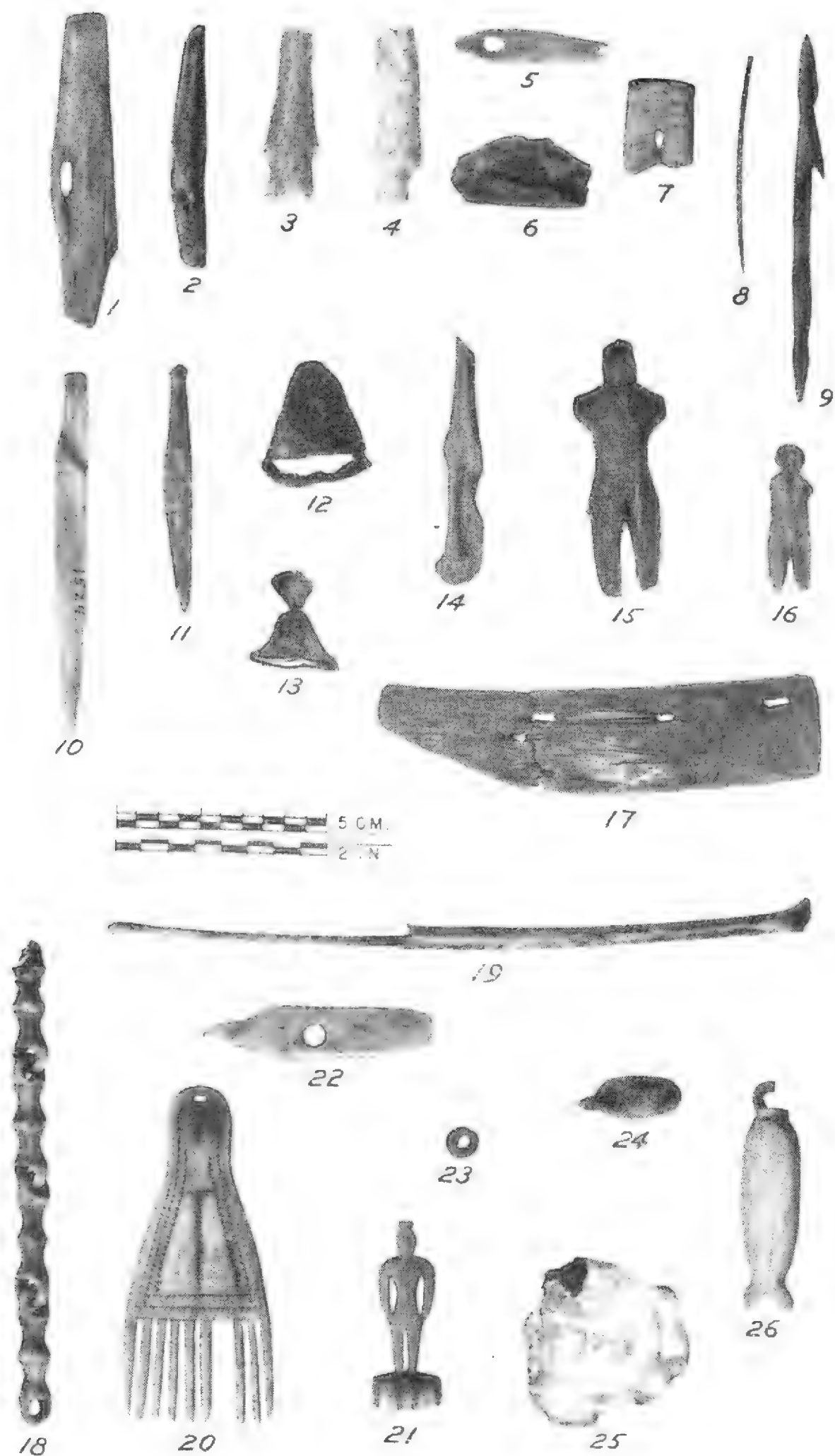
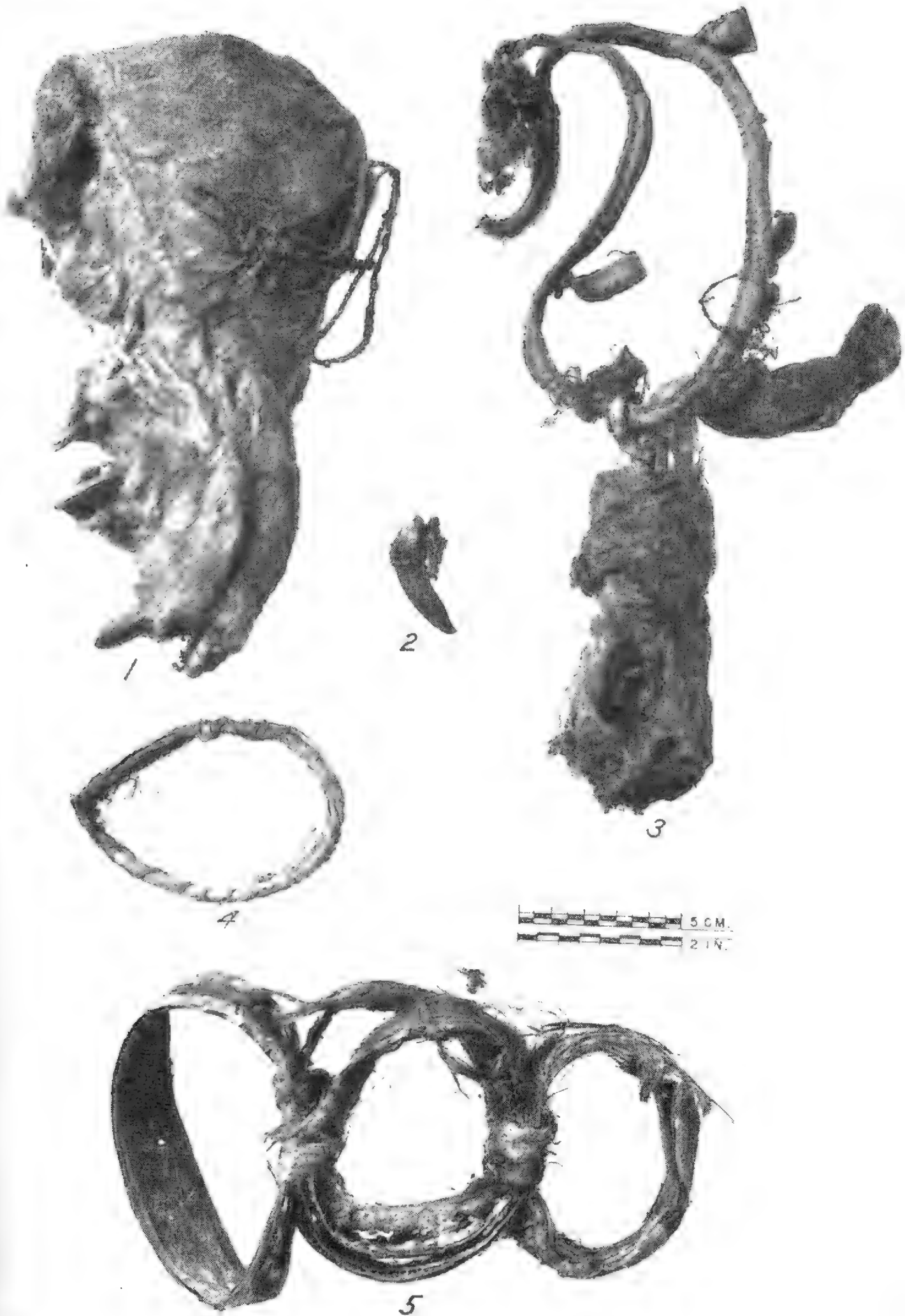


PLATE XIII

- Figure 1. Pouch made of seal flipper. M 1, House B, square 29, depth 12 inches.
Figure 2. Seal claw, sinew line attached. M 1, House B, square 28, depth 12 inches.
Figure 3. Necklace amulet, hunting charm. M 1, House B, square 29, depth 12 inches.
Figure 4. Baleen ring. M 1, House B, square 29, depth 15 inches.
Figure 5. Baleen rings lashed together. M 1, House B, square 20, depth 10 inches.



A PRELIMINARY REPORT ON AN ARCHÆOLOGICAL SURVEY OF SOUTHWESTERN ONTARIO FOR 1950

By Thomas E. Lee

From June 10 to November 23, 1950, the writer carried out an archæological survey of areas bordering on lakes Erie, St. Clair, and Huron. Emphasis was placed upon the finding of sites that would add to our knowledge of any poorly represented periods or fill gaps in the sequences already partly established by a survey in the preceding year, and upon the determination and identification of cultural evidences in relatively unknown areas. A fine spirit of co-operation was encountered among farmers and collectors, many of whom were keenly interested in acquiring archæological information bearing on their collections and upon Indian background and prehistory. Skeletal material, sherds, and artifacts were donated to the National Museum by a number of them.¹

Assistance in the field was rendered by K. C. A. Dawson for twelve weeks and by W. Taylor for five weeks, both from the University of Toronto.

The areas examined are bounded by lakes Erie, St. Clair, and Huron, and by a line drawn through Delhi, Brantford, Stratford, London, Strathroy, Mitchell, Hanover, and Southampton. In addition, quick checks were made of Pelee Island, Bruce Peninsula, eastern Manitoulin Island, and the east side of Georgian Bay. Topography and soil conditions were noted in connection with prehistoric sites. Several sites were surveyed; others were sketch-mapped.

One hundred and ten sites were found and twelve thousand artifacts were acquired. Several sites were test-trenched; six single burials and one ossuary containing six individuals were removed. Additional skeletal material was recovered from the surface and by donation. Three hundred and sixty photographs were taken of sites, test trenches, and material in collections. Seventy-eight collections were found, of which forty-two were photographed.

The variation in terrain, intensity of occupation, and cultural manifestations encountered make it desirable to consider sections individually; county divisions here conform fairly well to the changing conditions and are dealt with in progression from Norfolk westward along Lake Erie to Windsor, thence northward along Lake Huron to the Bruce Peninsula.

The cultural classifications employed in the 1949 survey report are used herein, and sites are considered from early to late within each county. The accompanying chart is a tentative assignment of sites to appropriate divisions of the McKern classification. It is recognized that, in view of the excellent evidence for a continuum of culture in Ontario from Owaseco to historical Neutral, the system is inadequate; within each of the designated foci is seen a considerable development in culture through time;

¹ Following is a list of those individuals whose donations to the National Museum were submitted through the 1950 survey: Frank Goessens, 115 sherds; M. d'Hundt, 1 (artifact), 27 sherds; P.O. Dean, 1; W. Jury, 1 sherd; Maurice Bossuit, 6; Alec More, 51, 2 sherds; Gordon White, 1; L. Stephenson, 4; J. Shuttleworth, 1 sherd; Lorne Bauer, 1; Charles Huffman, 14; Mrs. Phillip Wagner, 12, 1 sherd; Fred Levergood, 8; D. Tilden, 1; David Botsford, incomplete pottery vessel; Earl Wetherald, 1; Donald Claghorn, 21; Herbert Levitt, 1; Fritz Knechtel, 15.

further, the divisions are arbitrary. As more evidence is revealed, it will almost certainly be necessary to employ some such classification as Gladwin's Root and Branch.

NORFOLK COUNTY

This area of light sand and small dunes was briefly checked with special interest in Point Peninsula sites. Only two were found, although two others yielded sufficient evidence to show that they are early.

In the vicinity of Delhi an eroding dune revealed skeletal parts of at least two individuals; unfortunately, little cultural evidence could be found. Another site was found which, although in crop, produced sufficient samples of sherds, pipes, and other artifacts to indicate very close relationship with the Krieger Site at Chatham. It is large—perhaps eight acres—and surface indications are that it is rich.

ELGIN COUNTY

East Elgin is an area of light sand knolls with sand ridges marking old beach lines. On these were found nine Point Peninsula sites. One is a mixed site with surface indications of Point Peninsula, Owasco, and Uren. A few test squares produced Owasco pottery and two Point Peninsula sherds in association with post moulds, apparently of a house. Vinette I is present, although represented by only one sherd. The site is extensive and by no means uniform in surface manifestations. Stratigraphy probably exists, despite a century of cultivation.

Only three small Owasco sites were found; one of these resembles Krieger. A site near Lakeview may belong to this culture or to the earlier Point Peninsula; hundreds of net sinkers in all stages of completion have been removed from it by collectors and by local fishermen for use on modern nets; no trace of pottery has been found, and cultural identification is dependent upon a few projectile points which indicate its early position.

The Glen Meyer Focus, which includes the Goessens Site at Glen Meyer, is well represented in East Elgin.¹ Only one new site was found; test trenches produced sherds and one nearly complete vessel showing the close linkage with Uren. This is even more evident at the Downpour Site near Aylmer, which was trenched. A slightly earlier site in the same area was tested and produced a bundle burial. Grave goods were absent except for two sherds, probably unintentionally included, and a small slab of fossil-bearing limestone. The remains were of a large male, but the lower mandible of an elderly person, probably female, was placed at the base of the compact bundle.

Two Uren sites were found. One of these also has surface indications of an earlier culture, possibly Point Peninsula. A later site was examined; on the basis of pipes and a few sherds, it appears to fall between Pound and Southwold. An ossuary containing about twenty-five skulls is reported to have been found there some fifty years ago.

¹ Lee, T. E. A Preliminary Report on an Archaeological Survey of Southwestern Ontario for 1949. Ann. Rept. Nat. Mus. Canada, Fiscal Year 1949-50. Bull. 123, Ottawa, 1951.

KENT COUNTY

Very little work was done in Kent; the Krieger Site was examined for surface distribution of material, and some small sites were found. At the Julien mound a test trench was cut toward the centre from the southwest corner to determine whether more extensive excavation might be advisable. Although soil disturbance was visible, no material was found. All indications are that the mound has been completely destroyed by amateur digging; a few copper beads are found occasionally. Bits of marine shell and bone on the surface suggest that old reports of burials are correct.

ESSEX COUNTY

Much of this area is low and flat, with heavy muck soil in some parts and clay in others. Along the Lake Erie front and below Windsor along the Detroit River is a narrow belt of higher sand; in it were found several sites, but few occur more than 2 miles inland.

Only three sites were non-ceramic. One of these, on very scanty evidence, may be late Laurentian. Another on Pelee Island is associated with two large boulders that have been used in some manner for grinding: one bears eight depressions; these differ from the usual mortar basins in being oval and in having a smooth raised central portion in each. The third site belongs to Glacial Kame, yielding several sandal-sole gorgets.

On Point Pelee an attempt was made to find sites or burials containing pottery of a type removed from there by amateurs from Detroit, having characteristics of both Point Peninsula and Owasco cultures. Two such sites were found but produced only small samples. A site found on the 1949 survey was also examined with little success; from it two burials were removed but were without grave goods. Another site near Windsor may belong in a proposed Point Pelee Focus.

Two sites on Point Pelee produced Owasco type pottery and points. In the examination of one of these, very great assistance was given by the owner, Mr. D. Tilden, who operated a tractor-dozzer to expose a burial, a refuse pit, and several smaller features. Again samples were small, and the burial contained no artifacts.

A site near Kingsville yielded a small group of artifacts and sherds of Owascoid type and an ossuary containing the bones of an adult, an adolescent, and four children. No grave goods were found; the few non-descript sherds encountered were presumably accidental inclusions; the seriously crushed condition of the bones makes identification of the physical type uncertain. Otherwise the find would be of considerable importance, lying well outside the Neutral area as determined by the surveys, in possible association with an Owascoid surface manifestation.

Five large earthworks were found and the locations established for at least two others now obliterated. In every case artifacts are so scanty or the works so damaged by amateur digging that form alone remains as a guide in determining their position in time or their relation to each other and to other cultures. Full scale excavation might yield identifying material where test holes failed.

The earthworks appear to include fortifications, effigy mounds, and burial mounds. Two of the mounds consist now of roughly circular ridges of earth some 350 feet in diameter, with indications of gateways. Both were palisaded, suggesting their probable use as defensive works. One found by the 1949 survey has two remarkable spiral projections resembling at once an effigy and bastions. Its location on a high point formed by a creek and its branch makes the latter function more plausible. Extensive testing in its heavy clay soil failed to produce artifacts, flint spalls, fire-stones, or charcoal. The other, more irregular in outline and half destroyed by cultivation, was equally sterile.

Three mounds ranging from 180 feet to 360 feet in diameter were in the form of perfect circles. One was deliberately destroyed recently by a farmer; only a few segments of another remain, showing its original extent and shape, and one is almost intact and undisturbed, spared by the presence of numerous large boulders in the enclosed area. Few artifacts are reported from the two under cultivation. Trenching for palisades was not attempted. These may have been effigy mounds; perhaps their connections are with mounds of similar shape occurring in Michigan.

The burial mounds occur in two groups which are some 80 rods apart. One group, in heavy bush, includes two mounds; the smaller is about 25 feet across, is circular, and is reported to have contained one burial; the larger, about 100 feet across and now about 4 feet high, has been very seriously damaged by amateur collectors, some of whom employed hired labour. Seven burials are reported to have been removed from the east side, one from the south side, and fifteen from a point 100 feet to the east. A test hole produced human skull fragments. The mound, because of its rich black earth, is being hauled away for use in gardens. The other group of six or seven small mounds has been destroyed by cultivation; the largest, about 30 feet in diameter, is still visible.

On such evidence the age of the earthworks cannot be established. If used as defensive works, as at least two seem to have been, they must have been abandoned before or soon after completion. The absence of Neutral pottery and artifacts in the entire area may indicate contemporaneity of the builders of these works and the Neutral Indians. The mounds cannot be much earlier; earthworks are not a prominent feature of Owasco sites and are not present at Point Peninsula sites; furthermore, neither Owasco nor Point Peninsula evidence is very strong in the area.

LAMBTON COUNTY

A broad area about Sarnia was examined with particular care on the chance of picking up traces of pre-ceramic material similar to that found along the Saginaw River drainage in Michigan, since this would be the easy point of access to Ontario. Only four small non-ceramic sites were found. Of these, two may be assigned with some confidence to the pre-ceramic period, but neither bears much resemblance to the Michigan finds. It may be that most of the area was too low and swampy for convenient crossings or occupation.

Two Point Peninsula sites were found—both quite large—on higher ground. One largely destroyed by removal of gravel for commercial purposes is reported to have yielded several burials with slate grave goods.

One skull and some pottery were obtained; a large stone pipe of a very early type was examined and photographed.

In the hills to the northeast were found five—possibly six—sites closely related to the Goessens Site at Tillsonburg, and certainly within the Glen Meyer Focus. Trenching was carried out on two of these; a refuse pit was located, and from it were obtained almost all the sherds of a large broken pot.¹ On one site a larger sample may show closer ties with the earlier Krieger Site at Chatham. Another gives some surface indication of an earlier and possibly pre-ceramic culture.

Only one late site was examined. It is a large oval earthwork near Sarnia.² One side has been destroyed by cultivation; the remainder is in scrub bush. Although much dug-over by amateurs, test trenches produced ample material to identify it with the Wolf Site in Michigan,³ rather than with Neutral. The site is not rich, and indications are that it was occupied for only a short time. Within the earth circle is a large depression, probably artificial, which must have served as a reservoir, in the absence of any stream nearby.

An important source of flint was located near Parkhill. It occurs as an abundance of nodules scattered over an area of at least twenty acres of kame cut by a stream which must have exposed quantities of them. The flint is a distinctive mauve colour, somewhat like that found at Port Franks by Mr. Wilfrid Jury. It has not been observed on either exclusively Point Peninsula or Owaseo sites in Ontario, but in Glen Meyer sites it is the most common type. By Uren times it has dropped out of use and does not appear again.

MIDDLESEX COUNTY

Two small pre-ceramic sites were found, and a possible Brewerton-like site along the Thames was examined for surface specimens. In the cultural material and chippings is seen an emphasis on the use of slate for both chipped and ground artifacts; quartzite occurs mainly as cast-off chips. Another site, 2 miles away, produces mainly quartzite implements. This may indicate repeated occupation of the supposed Brewerton site.

One site is probably Point Peninsula, but sherds obtained were not sufficiently distinctive. Two others bear strong resemblances to Point Pelee; from one of these, east of London, two completely restorable pots and parts of others were removed by an amateur.

A large site of the Glen Meyer Focus was trenched. Although shallow, it is rich and has only recently been cultivated. Excellent comparative material was obtained from it. It covers about twelve acres of sandy soil. Sherds are noteworthy for the high degree of variation in design and technique. Several related but smaller sites occur within 5 miles of it.

HURON COUNTY

This is a remarkably sterile county, judging by survey findings and the almost total absence of private collections—a fact of considerable

¹ Restored, it is 15 inches in diameter, 18 inches high, maximum thickness $\frac{3}{4}$ inch.

² Boyle, D. Earthwork in Township of Moore, *Annual Archaeological Report*, 1904, being part of Appendix to the Report of the Minister of Education, Ontario, Toronto, 1902, p. 32.

³ Greenman, E. F. The Wolf and Furton Sites, Macomb County, Michigan. Occasional Contributions from the Museum of Anthropology, University of Michigan, No. 8, 1939.

significance in our interpretations. Scanty cultural material was observed along the Huron shore and the Maitland River. It is of interest to note the presence of two large quartzite blades reported found in the county; both are of quartzite, such as occurs at George Lake, and one compares closely in shape and size with the blades found there.

BRUCE COUNTY

Ten sites in possible association with the old shore lines, lake and river terraces, were examined, as well as three sites with no such suggested association. Seven were test-trenched; much important information was gained in addition to samples. Where insufficient material was available, full access to a large and completely recorded collection was granted by Mr. Fritz Knechtel of Hanover.

Pre-ceramic materials occur along old shore lines in sites that are large, extending for unknown distances under wooded sand dunes. In one site, well over four acres of closely packed fire-stones are exposed. Fire-stones are a prominent feature on all the sites. The cultural material varies somewhat from site to site; in some, an emphasis on the use of slate and quartzite is seen; on others, little slate or quartzite occurs, but heavy chipped choppers of hard igneous or metamorphic rock are frequent. Large spalls struck from boulders, sometimes slightly retouched, were much used. Most of the materials, but not all, are indistinguishable from those found at Tadoussac and other points in Quebec. At some points, low circular mounds of pebbles and boulders occur along old beaches exposed by wind erosion. Some are composed of fire-stones only; others show no indications of heat. Both types were cross-sectioned; beneath them were beds of dark ash and charcoal, sometimes stratified, containing neither cultural material nor bone refuse.

From one non-ceramic site was removed a much-scattered burial. In the midst of the bones was a deposit of reddish sand—probably powdered hematite. Two copper awls were found nearby by an amateur.

At some points the pre-ceramic sites were re-occupied by a pottery-using people. Attempts to find an undisturbed stratigraphic situation on various sites by trenching failed; removal of soil in one-inch levels gave positive proof that the areas involved had been ploughed, even where now covered by wooded dunes 15 feet high, although three generations of occupants have no record of cultivation. On one site a small pit was found beneath the disturbed area, and potsherds were discovered in association with numerous fire-stones different in character from those on the exclusively pre-ceramic sites. The pottery has a predominance of Point Peninsula characteristics but is not identical with it, although certain New York types occur. Wherever present, small stemmed points have been found with it. Vinette I, pseudo-scallop shell, and a high proportion of rocker stamped sherds occur. The latter trait is present on sherds marked by dentate, cord-wrapped stick, and pseudo-scallop shell decoration.

One large and rich Point Peninsula site was trenched where threatened by erosion. Stratification was revealed, caused by deposits of silt in river flooding. Variation observed in the sherds may assume importance later with more extensive excavation and larger samples.

One site differing from Point Peninsula but belonging in the Vine Valley Aspect has later material on the surface. A test trench produced sherds, a celt, and parts of pipes which indicate close relationship with the Hurons. The locations, historic reports, and slight variations in design make it probable that the Petuns were the later occupants of this and certain other sites. Neutral characteristics, especially Middleport, indicate close association with that culture.

Two sites, presumably Petun, were found. On one, surface collections were supplemented by the finding of a large vessel, intact below the shoulder, upright in the soil. It contained part of the skeleton and skull of a child. Among the bones in the bottom were three boiling stones, blackened from the fire. Again Middleport characteristics are present in sherds and pipes.

OBSERVATIONS

The accumulated evidence of the 1949 and 1950 surveys permits the formulation of certain generalizations and theories that are applicable to a large part of the southwestern peninsula. Although excavation of several key sites will be necessary to obtain the large samples required for statistical analysis and to prove relative ages by stratigraphic evidence, much has been accomplished toward reducing or filling gaps in our projected sequence of cultural development in Ontario.

The presence of pre-ceramic sites in Ontario has been established. On typological grounds, as well as characteristics of sites, there appear to be at least two branches or, possibly, time levels involved. In the Lake Erie periphery are small sites, usually located on high clay knolls and at elevations of 775 feet or higher. On such sites the emphasis is upon scrapers, with very few projectile points. Flint is of the types obtainable from river gravels and glacial drift. In the Bruce Peninsula, however, pre-ceramic sites are large and occur at only 600 feet elevation or slightly higher. Emphasis shifts to coarse and heavy choppers and other chipped implements of unknown use, some of which greatly resemble hand axes. Both quartzite and slate chips are found in quantity, but only slate occurs as artifacts, usually in the form of celts or large chipped implements that may have been hafted scrapers. Resemblances to Tadoussac materials are striking. One site along the Thames River combines some of the traits observed in Bruce County with some of Brewerton and other cultures. Fewer choppers occur, slate artifacts are usually polished, and projectile points are much more numerous.

It is not entirely certain that Vinette I is the earliest pottery type in Ontario: unfortunately an undisturbed stratigraphic series has not been found. Vinette I was obtained from a site at Port Bruce on Lake Erie and in the Bruce Peninsula.¹

Point Peninsula sites cluster in the sand region along Lake Erie from Long Point to Port Bruce, with an occasional small site as far west as Chatham and north to London. They again cluster in the Bruce Peninsula, but surface collections include additional sherd types as yet unclassified and possibly earlier. In both areas the sites are usually on old beach lines. One site occurs at Port Franks.²

¹ Two Vinette I sherds, now in the National Museum collections, were found by Dr. W. Ritchie at the Parker site.

² Excavated by Mr. Wilfrid Jury, University of Western Ontario, 1950.

The Point Pelee sites appear to be slightly earlier than Owasco, with a much higher proportion of dentate stamping. However, rocker stamped sherds are either absent or rare, which constitutes a serious difficulty in the proposed development of Owasco out of Point Peninsula. Examination of collections on Pelee Island reveals the presence of similar material there: it is probable that strong influences out of Ohio are involved in Point Pelee variations from Owasco. A closely related site at Dorchester is marked for early excavation.

Owasco sites occur throughout the sandy area bordering Lake Erie from Long Point to Windsor but as yet are not reported along Lake Huron. An early site is located at Long Point, while the Krieger site at Chatham represents late Owasco in Ontario.

From Krieger to historic Neutral the sequence is virtually complete. The remaining task is the positive identification of one or more documented sites. The numerous large sites of the Glen Meyer Focus, grouped in a broad oval area, the long axis of which rests on Long Point and Ipperwash, form the connection between Krieger and Uren. The probable considerable time span involved, together with noted developmental changes, renders the application of the concept of focus unsatisfactory, of course, and it is here employed only as a temporary measure. Among the earlier sites is the Goessens Site at Glen Meyer.¹ The later sites of the sequence are mainly in the northwest and central part of the area; it is noteworthy that the prominent flint type on the later sites has its source in deposits near Parkhill and Port Franks. By Uren times this source was abandoned and grey flint again became predominant. The later sites also are characterized by an enormous variety in pottery forms, designs, and techniques, possibly stimulated by contacts with peoples from Ohio by way of Pelee Island and from Michigan.

Uren sites cluster in the Aylmer-Tillsonburg district, but occur also as far west as Chatham.² Later Neutral groups tended to concentrate in the region between London-St. Thomas and Niagara, with an occasional earthwork or village westward to Rondeau. Since the Detroit River forms an obvious natural boundary, the apparent absence of Neutral material in the little peninsula west of Chatham—only 50 miles from Windsor and the river—together with the occurrence in the peninsula of numerous earthworks, suggests contemporaneity of two cultures, although proof is lacking. At Chatham, a site now almost totally destroyed by relic seekers has yielded Fort Ancient pottery, in addition to sherds like those of the Wolf Site in Michigan. An interesting feature of some sherds is an apparent combination of Fort Ancient and Lawson designs and techniques. Both cultures are late; it is not unreasonable that they may have met at this point, adjacent as it is to the island route across Lake Erie. Windsor collections contain much Fort Ancient pottery believed to have been found in Essex County. Only one other Wolf occupation in Ontario is known, occurring at Sarnia in a large earthwork.

The Petuns, a late and historic group, may have been responsible for a number of sites in Bruce County. A late off-shoot of the Hurons—

¹ Excavated in April 1950 by a combined party representing the National Museum of Canada, University of Toronto, University of Michigan, Wayne University and Carnegie Museum, Pittsburgh. Report now in preparation.

² Uren-like sherds are reported from southern Indiana by Mr. Vernon Helmen. They were examined and accepted as such by the writer. The captive women explanation seems acceptable.

possibly no more than a clan division—their cultural remains are likely to prove indistinguishable from those of the Hurons. It is important that Jesuit missions to the Petuns be located and identified, if possible.

SPECULATIONS

It is tentatively suggested that the earliest occupation of southwestern Ontario occurred at a time when large parts of the area were beneath ponded waters or in a marshy condition. Small hunting bands, relying in part on fishing, apparently occupied the higher ridges and knolls. Soon after—or perhaps at the same time—large groups lacking pottery and practising a hunting-fishing-gathering economy moved down out of northern Ontario across Manitoulin Island and smaller islands to the Bruce Peninsula. The easy shore-line route may then have been followed southward; the presence of limestone caves and suitable rock shelters along the insular and peninsular chain suggests that these were used and that important information may be recovered from them. The movement to the south appears to have halted in the vicinity of the Saugeen River where we may suppose fishing became a major subsistence factor.¹ At the same time, other groups with this culture may have taken the Ottawa River route eastward into Quebec.

Early pottery-using peoples probably took the same insular route to Bruce Peninsula, progressing no great distance south of the Saugeen River, where they occupied the same old beach lines. Point Peninsula sherd types, from early to late, suggest a long occupation of the area. The hypothesis is here advanced that Point Peninsula peoples coming from the north and west had certain pottery types which did not carry beyond the lower Ottawa Valley. Considerable time would have lapsed in the spreading of the culture over eastern Ontario into New York State. At the same time, trends in the Bruce Peninsula, as elsewhere, would be toward later forms of the culture. New bands may have arrived, too, over the same route. It should be noted that Point Peninsula sites along the north shore of Lake Erie resemble New York sites much more closely than they resemble Bruce Peninsula sites.

Vinette I is the oldest pottery type in New York State. It is much more plentiful there than in Ontario, on the present basis of knowledge. Its resemblance to early Illinois pottery (Fayette Thick) has long been noted. Perhaps Vinette I is the result of influence out of Illinois rather than from the north. If so, the idea, rather than a people, may have come eastward. The scanty occurrence of Vinette I in Southern Ontario, including the Bruce Peninsula, may then be explained in terms of a slight backwash from New York in middle Point Peninsula times.

The apparent absence in the Bruce Peninsula of Owasco remains or of any other culture until late Petun or Huron is an indication that the area was abandoned for a time. Probably small bands were constantly moving out. The wide and almost sterile region to the south makes that route unlikely except for occasional shore-line travel. Another water route is available, however; the headwaters of the Saugeen River are only 3 miles from the upper reaches of the Grand River. It may be

¹ The sites are on old shore lines, but it is recognized that determination of age on this basis alone is not possible.

significant that Point Peninsula sites previously reported occur principally in the vicinity of the lower Grand River. As in the case of the pre-ceramic cultures, it is probable that Point Peninsula bands were during the same period travelling eastward along the Ottawa River and by other routes.

Cultural changes in the direction of the later Owasco were taking place in Ontario. Influences out of Ohio by way of Pelee Island—and out of Michigan—are strongly indicated in pottery, artifacts, flint types, earthworks, and distributions. Cultural exchanges with New York are undeniable.

Primitive agriculture entered the subsistence pattern at least as early as Owasco times. Population pressure must have been increasing. In New York State, Owasco sites were palisaded. The later Glen Meyer sites, as represented by Goessens, were also palisaded. In the light of these circumstances, the reported absence of palisades on the considerably later and clearly related Uren Site¹ probably does not apply to some other sites of the same culture. The Glen Meyer sites are separable into two groups on the basis of types of flint used. This may arise out of proximity to two flint sources lying at the extreme limits of the occupied territory—or it may represent a time difference. Until suitably large samples are obtained for statistical analysis, both factors are presumed to have been operative.

Throughout the recognized Neutral sequence, changes took place in the extent of territory occupied and in points of concentration. These are not fully worked out. The importance of finding and positively identifying a documented or historic Neutral village site should be emphasized.

In conclusion it should be pointed out that a clear and unbroken sequence of cultural development in Ontario is now recognized extending from early Owasco to historic Neutral. Although Owasco cannot be derived from Point Peninsula to our complete satisfaction, it is believed that transitional sites will yet be found. It is increasingly evident that the sequence of culture following Owasco developed over a period of approximately a thousand years. Such time depth is of the greatest significance in any consideration of northeastern archæology and especially of Iroquoian cultures.

Chart of eight maps showing site locations for the following cultures; earthworks also are charted.—

Pre-ceramic
Glacial Kame
Point Peninsula
Point Pelee
Early Owasco
Glen Meyer
Earthworks

Neutral
Petun?

¹ Wintemberg, W. J. *Uren Prehistoric Village Site, Oxford County, Ontario*. Bulletin 51, Anthropological Series No. 10, Nat. Mus. Canada, Ottawa, 1928, p. 51.

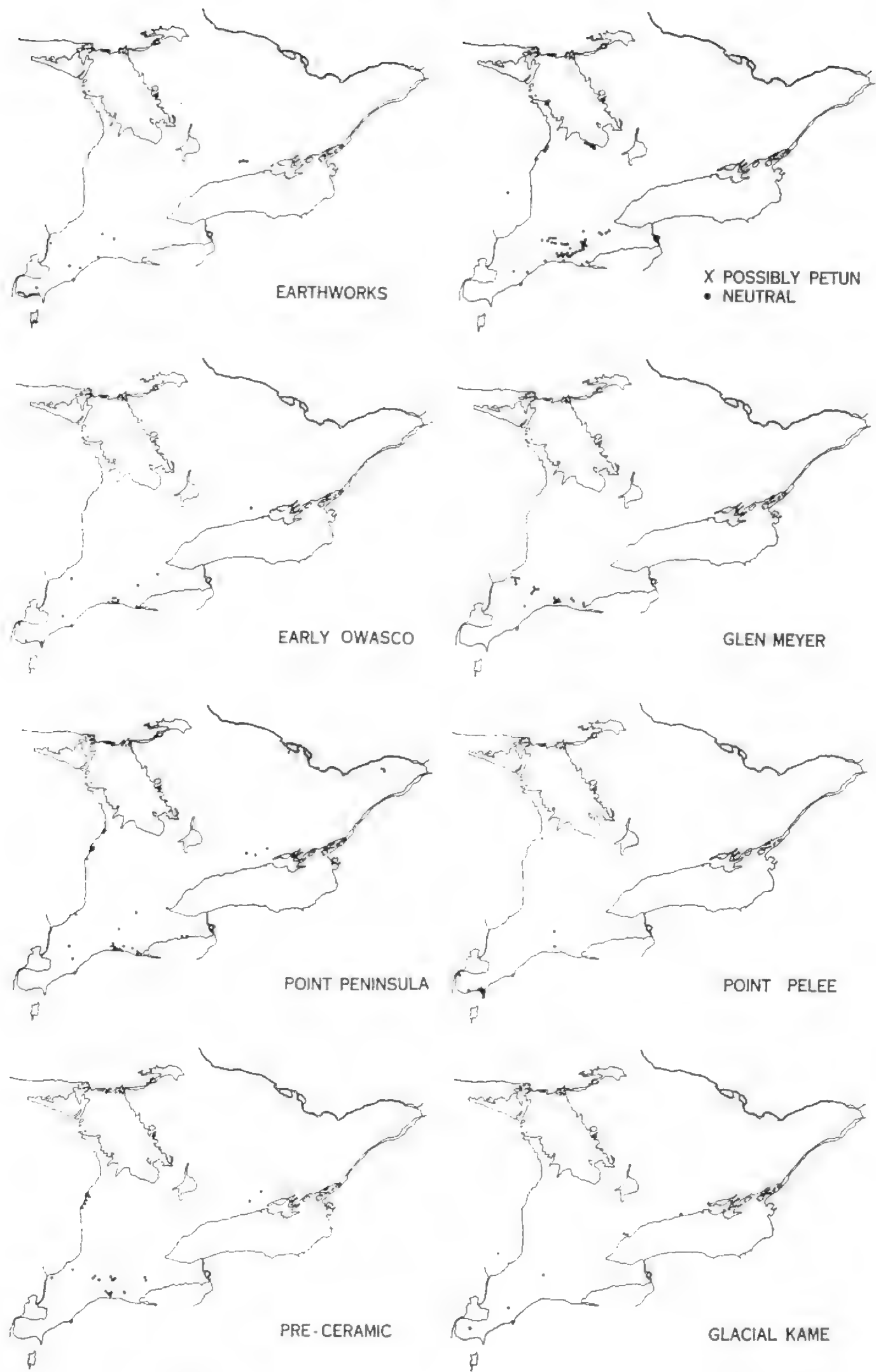


Figure 3. Cultural distributions in southwestern Ontario.

Cultural Distributions in Southern Ontario¹

Pattern	Phase	Aspect	Focus	Component		
Final Woodland	Upper	Iroquois	Whittlesey	{ Parker McGeachy		
			Huron	{ Shutt Nodwell		
			Petun?	{ Lucas II Boiled Baby		
			Neutral	{ Lawson Southwold Pound Middleport Uren		
Late, Middle, and Early Woodland	Northeastern	Owasco	Glen Meyer	{ Downpour Braun Too Reid Stafford Smale Fisher Woodsmen Holmes Faulds Goessens		
				Krieger	{ Krieger McKnight	
			Port Royal	{ Vandewyngaerde III Reimer		
			Point Pelee	{ Beecham Tilden Baird Delaurier		
			Point Peninsula	{ Donaldson Port Maitland East Sugar Island Kant Pineo Avro Fuller Pine River Kemp		
				Vine Valley	{ Vandewyngaerde II Knechtel II	
		Pre-ceramic	Laurentian	Lucas I
					Brewerton?	Komoka
				Inverhuron	{ Fritz MacDuff Mackenzie Knechtel I	
				Sparta Ridge	Numerous small sites	

¹ Tentative classification; to facilitate comparison with the work of Ritchie. Not entirely chronological.

FOLK-LORE OF THE VANTA-KUTCHIN

By Douglas Leechman

The Vanta-Kutchin are a branch of the Loucheux tribe and occupy the village of Old Crow, Yukon Territory, where I stayed from the 14th of July to the 24th of August, 1946. This village is situated on the north bank of the Porcupine River about a mile west of the point where the Old Crow River joins the main stream. The population, apart from a few white people, consists of approximately one hundred and fifty Indians.

I collected ethnological data from a number of informants. They were all willing to discuss what they know of native beliefs and customs, but the process of acculturation has been almost continuous for over a hundred years now since John Bell first came down the Porcupine River in 1844. The village of Old Crow would appear to have been established about 1912. Most of the Indians there speak English, especially the younger and middle-aged people, but in talking among themselves they always used their native Loucheux (Athapaskan) language. The people have a large repertoire of folk tales but were reluctant to embark on the dictating of the longer ones which, they said, would take hours to tell. In the following notes, no attempt has been made to correlate the data gathered with the work of other authors, and most of the material is recorded as noted in the field. Grammatical errors have been corrected and occasionally a lengthy explanatory sentence has been condensed for the sake of clarity.

FOLK-TALES

A Man Who Left His Wife

He was always mean to his wife. One morning there was a long tear in his pants, and they were ready to move camp. He told his wife to sew them up, but she said there was no time. He got mad, fought with her, and tore all her clothes off. Nobody said anything for fear that he might be a medicine man. In those days nobody butted in.

He told everybody to go ahead, and he put out all the camp fires with snow and left her there to freeze to death, leaving not a spark. An old woman saw that something awful was going to happen, so she took a hot coal out of her fire, covered it with brush, and sat huddled over it. She tore her moccasin to give her an excuse to stay behind. He put out her fire, and then he went on. He couldn't make the old woman hurry up, so he left her. He knew all the fires were out and that the old woman had only an awl and no fire.

When he was far away, the old woman made a fire from the red hot coal she had hidden and warned the man's wife not to make a big fire in case her husband saw the smoke. She gave the girl her awl and a little knife. She took off some of her own clothes, pants and shirt, almost all she had. The old woman wished her luck and left.

The girl kept her fire in rotten wood, and in the old camp were Canada jays and crows.¹ She looked about where careless young people had lived, collected scraps of sinew, and made snares for the jays and

¹ Jays and ravens, searching for edible morsels.

crows. She ate the meat and used the skins for clothes and got sinews from the legs. Soon she caught rabbits for food and clothes and even had a tent of rabbit skins woven from long strips. The whole skins are not strong enough. If her fire had gone out, she would have frozen. She saved all the sinews of animals and birds, and towards midwinter she had enough for a caribou snare. She followed a caribou trail and snared one. With the skin, she made another snare and got a moose, then she was safe and well fed. She tanned the skin and made nice clothes. Her people thought she was frozen to death.

When summer came, she moved down to the river bank with her rabbit-skin clothes and tent. She fished with a babiche fish net. One day two young hunters came down the river but didn't know her. She called out to them, "Just call me 'White object on the bank'." They went up to her, and she told them her whole story. The two boys saw that she was a clever woman, and they asked her if they could marry her. She said, "Yes." The next day the two boys went hunting on the mountain. While they were gone, she threw away her rabbit-skin clothes and dressed up in her best caribou-skin clothes and moccasins and put up a nice caribou-skin tent, with spruce boughs on the floor. When the boys came home they thought they'd come to the wrong place. She laid a bed on each side of her own with a man's new caribou-skin suit on each.

They killed a lot of caribou and moose for her, made a big cache on the lake shore. From the Achilles tendon of the moose, dried hard, she had already made some sharp spear points.

The two boys knew their people must be worried, because they had been away all winter, and they knew, too, that their people were not far away. They decided to hunt in that direction. They found their people and discovered they were starving. When they found this, they came right back, and the girl agreed to help and send them with pemmican. She found these were her own people too. Among them were her ex-husband and his mother, who had also been mean to her and unkind. This old woman was there too. The girl sent the boys with pemmican, and they led the people back to her and her cache. When they got there, the girl was handing out bundles of meat and fish to the people. While they were making camp, she gave each enough to last the night.

When her old mother-in-law came, she overlooked her on purpose to see what she would do. The old woman said, "And she's supposed to be my daughter-in-law!" The girl answered, "Yes, you never thought of that when I was left to starve and freeze." As she said this, she seized one of the moose tendon points and threw it. It struck the old woman in the calf and stuck in. After that, her old husband came with a small knife and said to her two young husbands, "I'll give you this for my wife back." The men refused and threw his knife back to him.

She had put up two tents facing each other, to the surprise of the two men, and filled one of them with all sorts of food and clothes. She called the old woman who had befriended her, led her to the tent, and cared for her for the rest of her life, cooking for her and giving her hot soup.

The Man Who Killed Two Chiefs

Moses Tezya told me that, in the old days, not only was the population much greater than it is to-day, but the men were much bigger and

stronger.¹ He pointed out the similarity between the Bible story of Samson and this local Indian story:

There was once a man who was very strong and big and who killed hundreds of men. At last the people decided that he himself should be killed, and, when he learned of this, he took refuge with two of his nephews at the headwaters of the Porcupine River. His retreat was discovered, and a group of Indians attacked him. Arrows had no effect on him, and he rushed at his attackers and killed many of them using the jaw-bone of a moose as a weapon. At last he was driven to the top of a steep cliff, and here he squatted down, weak and exhausted, but still dangerous and defiant.

When he got to the top of the cliff where he sat at bay, the arrows were as thick in him as quills in a porcupine. Then, indifferently, he plucked them out and broke them up to kindle a little fire to warm himself at.

Two chiefs coveted the dentalium ornaments in his hair and tried to get them, but he, knowing what they had in mind, rolled on the ground in such a way that all the shells were broken. Suddenly he seized the two covetous chiefs, taking one under each arm, and plunged to his death and theirs, over the cliff. He fell with such force that his intestines burst out, and the two chiefs were smashed beyond belief. The yellow stain down the face of the cliff, where his blood gushed out, can still be seen.

The Origin of Phratries

There was a man and a big loche (*Lota maculosa*). The loche went from town to town swallowing people, and the man followed, trying to catch up. One day, when the loche had eaten hundreds of people, he pulled up on the shore and rested (as a result of the man's medicine). The man found in each town that the loche had eaten everybody, and at last he caught up to him resting on the shore, lying on his back. The man stamped on the fish's belly, and people ran out. Those from the mouth were *nahsich*, those from the rear were *gitsha*, and those from the navel were *tangeratsa*. These phratries are still recognized, but people have to stop to remember who is who.

The Little Boy's Trail

One old woman stayed behind to snare rabbits when the rest of the people moved camp, and she persuaded the parents of a little boy to let her keep him with her for company. At first all went well, but as winter came on the rabbits grew fewer and fewer, three or four and then only two, then perhaps only one in two days. As her hunger grew, she became greedy and gave the little boy only the guts and ears and other unpalatable and repulsive bits. At last he decided to run away and try to find his parents. When he judged the old woman was at the far end of her trap-line, he took the one rabbit in camp and started along the old trail the people had left long before.

At night he made a camp bed of spruce boughs beneath a tree and ate one leg of the rabbit. This carried him a long way. Now and then

¹ This is a common belief: their deterioration is held to be caused by white man's diseases, food, and clothing.

he came to places where he saw they had killed caribou, but he would not camp here, lest the smell should attract wolves or grizzly bears, but would camp a long way farther on.

At one camp, he saw a number of trails leaving it and wondered which was the right one. He followed one of them for a long way, and this came to an open camp,¹ so he knew it was only a hunter's trail after caribou, and he had to go back and try another. This proved to be the right one, and soon he found a new trail crossing the old one. Now he felt sure he was right and ran fast along the new trail. Fortunately he was warmly dressed in rabbit skin, but his moccasins were wearing out. He had a neck wrap made of many strings of rabbit skin, and he tore these off, one by one, to stuff in the holes in his moccasins.

In those days, when there was always danger of attack, people kept a good look-out along all the trails, and the little boy knew better than to run into camp without a warning. When he came to a large woodpile, he knew he was near camp and that somebody would soon come for wood, so he sat down on the top of it and waited.

Soon a woman, coming for wood, saw somebody sitting on top of the woodpile. She threw snow on top of her rabbit-skin hood, so that she could not be seen, and came closer. When she saw it was only a little boy, she said slowly, "Who are you, and where did you come from?" He told her that he had been left with the old woman who stayed behind to snare rabbits, and she cried loudly for all the people to come.

At first his parents would not believe a small boy could have travelled so far on an unknown trail alone, but when they undressed him in their tent, they knew it was really he. Everybody said it was a difficult trip for such a small boy.

The Big Fish

Once there were two couples staying at a place where a creek ran from lake to lake, and they set a trap there to get fish for the winter. They caught and dried many fish that summer and were ready for the autumn. They were going to make a cellar, and when they had finished they were hungry for meat.² The two men went into the mountains for meat to dry, and the two women were alone. They noticed that the lake was rising fast. They tried to move their things up the bank. They knew about the big fish in the lake. Soon they heard a wild noise like a whirlwind coming to them. They seized a bale of fish each and put a child on top of it. They ran with the packs to the top of a high hill, and, looking back, they saw the great fish coming. It came close to where they had camped and seemed to smell about. Then it spouted the water high in the air, like a whale. The fish forced his way through the creek to the next lake, tearing up the ground, and left the first lake dry. He tore the ground open as he went. They sat up on top of the hill all day, because they were frightened, and then, towards evening, they went back to their camp, but there was nothing left; so they waited for their husbands to come home. The men could see the lake was dry, and they knew something of the sort had happened, because they knew the habits of this kind of fish. They were wondering if their wives were alive or not. The women

¹ Temporary overnight shelter.

² Having eaten nothing but fish for a long time.

ran to them and told them they were safe. The men had had good luck with hunting and had lots of meat. All their hard work with the fish was lost. So they took their wives back to the mountains where there were lots of caribou, and they dried meat there, and they had enough for the winter.

The Young Man With Two Girls

A young married man and woman left each other. The only way he could quit her was to go far away. He went a long way. First he camped where there were two old women, mean, who killed anybody who came along. They had sharp points tied on their elbows. They would ask a stranger to sleep between them. They tried to be nice so that strangers would not know what they were. They tried this on him and made a bed for him.

He could not trust them, in those days.¹ He was awake and suspicious. In the night he reached out for one of their sacks of clothes and put it in his place, and then a second. They started, both of them, to stab with their elbows, stabbing their own sacks of clothes, while he stood and watched.

He saw this was their plan. He grabbed a burnt stick and killed them both and left them there.

Then he started off again and soon came to a man living alone. He camped here, and the next morning, just after he left, the man started to chase him. The boy ran towards a stream. The old man cried, "My son, there is a bad place there." Usually people turned back when he said that and then he killed them, but the boy did not.

There was a place there where there was a lot of driftwood, and most people would sink in it, but the boy grabbed a young spruce tree, roots and all, and as he was running, he threw it, as one would a spear, to the middle of the morass. By medicine, the spruce split the morass open, and he ran across by that way. Behind him, it closed up again.

He travelled on and on, trying to get far from his wife whom he loved but must leave. He came to two women living in two tents facing each other. One was called Glodedtha, "Lemming", and the other Tattsoth, "Mouse". The boy was very hungry as he had travelled far. Mouse went out to get some grub, which was piled just outside the tent. She had sweet roots pounded up and mixed with stone berries. She came back in with this pemmican, and he saw it was good to eat. Lemming also went out to get some food. She brought back dried human ears. He found out that Mouse was a good woman and Lemming a man killer. He camped with them and ate Mouse's food, pretending that he was eating the ears, but he dropped them in his coat. Lemming was scared, because this food should have killed him and he was still alive. He got up, and they let him go. Only Lemming was mean, and she was scared of him.

He went on and on till he came to a kind old woman's place. In those days people were afraid of strangers, and when they first saw each other they didn't say who they were or anything, as they might be bad people. He camped with the old lady, and she hung out his wet clothes for him. Next morning he had dry clothes to put on. When he got dressed, he asked if there was anybody living close. She said there was a big

¹ When any stranger was presumed an enemy.

camp not far away. He went towards it, and there happened to be a chief's pretty daughter there. The boy was handsome, and she fell in love with him. The people had big dances, and these two danced together all the time. She was always on his heels.

When the boy first left his wife, she started to follow him, because she didn't want him to leave her. All through his dangers she was three days behind him, trying to catch up. She passed all the dangerous places he did and did just as he did to all these people, which means that their medicine was alike.

When she reached the kind old lady's place (she was a rich old woman whom nobody knew much about as she lived alone), in the evening after they ate, the girl asked if she had seen any people passing by. She didn't want the old lady to know that she was following her husband.

The old woman said she lived alone outside the town. Then the girl told her how her husband had left her and that she loved him and had followed him. The old woman decided to help the girl out. She took out her skin bag and pulled out a fine dress of cloth and a "mouth organ"¹ (something you whistle through). She told her to put the dress on before she got to town and to remain unseen with a handkerchief draped over her face, and to play the mouth organ but not to act foolish with it.

There was a dance that night, and the girl dressed up and went among the people, dancing. The boy who had left her didn't know who she was, and all at once he saw a second pretty girl in addition to the chief's daughter. She (the chief's daughter) asked to borrow the mouth organ, but the old woman had told her not to lend it. Now the boy had two girls in his head and didn't know which to take. The chief's daughter was a little wild, and the other (his real wife) was quiet. He liked the quiet girl better and danced with her all the time. As they danced, he told her to go to where he was staying that night. She said, "All right", and this night he did not take the chief's daughter home as he had been doing. His real wife came to his tent, and when she woke up he was playing with her hand. She pretended to be asleep. He recognized his own wedding ring and turned her hand about and about and was sure of it. This was the same ring he got married to his wife with. He looked carefully at her face, but the old woman had painted it. Still he was convinced that it was his own wife he had fallen in love with all over again. He broke into tears of relief and pleasure; "I have been through many bad places and never thought you could follow the way I came." She told him she had done the same things he had done and what the old lady had told her to do.

The chief's daughter was all forgotten and crying broken-hearted at home for this boy. They went back to the old woman who had been so kind and did everything for her, because it was through her that everything was straightened out.

The Loon's Necklace

Effie told me the story of The Loon's Necklace with minor changes. The blind man shot two moose, which his wife smoked and dried. The loon dived three times to effect a partial cure and three more for a complete

¹ Possibly a whistle made from a willow shoot.

one. The blind man returned to his wife and asked for water. She gave him water filled with pond life, and he just opened his eyes, threw the water in her face, and killed her. Before, when his little girl (there were two children with him) led him to the pond where the loon was, he found the smoked meat and knew what his wife had done.

The Girl Who Married a Dog

Two girls once met an old dog who was so poor that one of them laughed at all parts of him. Next day, the girl who had laughed met a handsome young man and fell in love with him and married him. When she had children they were pups, and the fine young man was the ragged old dog.

This tells us not to laugh at any animal or person, because we never know what they really are inside.

Muskrat and Beaver

After the flood, when the world was all right again, Muskrat and Beaver were coming down the Porcupine River and saw the Old Crow Mountains. Beaver told Muskrat to go up to the top and see what he could see. From the top he could see lots of lakes (Crow Flats) and decided to stay and live there. He told Beaver there was nothing but hills. "I am too tired to go on. I'll rejoin you tomorrow," he said. When the Beaver had gone, Muskrat went to the Crow Flats. That's why there are lots of muskrat there and no beavers. Beaver went on to Black River and stayed in a good place. That's why there are lots of beavers there.

One day Beaver and Muskrat traded tails. This was when Muskrat told Beaver to go on. Muskrat had a large tail, and he knew it would be of no use to him in little lakes, but Beaver had a small tail which Muskrat wanted, and so he talked him into trading.

The Widow's Revenge

Once there was an Indian woman whose husband was killed by the Eskimos. For a year she wept and grieved, and then she began to scrape skins, making suits of clothes and tents all decorated with porcupine quills. With these she paid the men who were to help her fight the Eskimos in revenge. When all was ready, she led them to an open beach where many Eskimos were camped. By her magic and her beauty and her fine clothes she was able to distract the attention of the Eskimos who were always on their guard. She appeared on the beach and danced. Gradually they gathered round her, and she lured them to the water's edge. This was the pre-arranged signal, and suddenly the Indians fell on them and killed them all.

Brushmen

Prominent among the folk-tales of the Vanta-Kutchin are stories of brushmen; the nature of these people is explained in the first of the stories which follow. One of the native names for them is *djinjeray* which is derived from a root meaning "dark". Another name is *nanaich* which is derived from the root *nain*, meaning "hiding away".

It seems probable that the many tales about them are founded in fact, for it is entirely possible that individual natives have isolated themselves from their fellows and lived alone in the bush for extended periods of time. I was told also that brushmen were sometimes solitary survivors of groups of people who had been almost exterminated by starvation.

The natives, especially the women, stand in considerable fear of brushmen, though they concede that they are not usually bad people though sometimes they were admittedly a little bit "bushed", a local expression meaning eccentric, as a result of long solitude. The Indians insist that some brushmen were white men; trappers, prospectors, or men who had deserted from the Mackenzie River steamboats. They point to Albert Johnson, the "Mad Trapper of Rat River" who was prominent in the news a few years ago, as an example. There are also a few tales of brushwomen, and these anecdotes follow the same pattern as those told about the men.

Balaam's mother was one of two wives married to one man, and ("as usual", Balaam says) there was trouble and jealousy. So his mother, the younger of the two, put packs on two strong young dogs and set out on foot. She travelled along the tops of the mountains for some 250 miles that late summer and came at last to La Pierre's House on the Porcupine River. Here she stopped, feeling safe from pursuit and pleased with her new friends, and here she met Balaam's father and married him. She had no adventures in her travels, except that once she thought she saw a "brushman" at which she was very frightened, as she knew that, if he saw her, he would force her to become his wife. Fortunately it proved to be nothing more dangerous than a wolf, sitting down at the mouth of a ground squirrel's burrow.

Balaam explained in detail about the "brushmen". When a man experiences some great sorrow, such as the loss of his wife or of all his children, he has a strong desire to get away from other people. He wanders away into the bush, desolate and lonely, to die far away and undisturbed. Nothing matters to him now, for he has lost everything that made the struggle to go on living worth the effort.

As he wanders on, the solitude and the peace soften his grief, and hunger begins to make itself felt. From long habit he sets a snare for a rabbit or catches a grayling in the shallow summer brook and so lives for a few more days. Soon he establishes himself in his new way of life. He traps and snares larger and larger game, even caribou. He dries and smokes the flesh and makes himself clothes from the hides.

He burrows a cave in the side of the sandbank and hangs skins over the entrance, and here he dens up for the long cold winter with a little fire and his store of dried meat, waiting for the return of the warm summer weather and a chance to get fresh meat again. Some brushmen build a cabin of poles and chink it with moss.

Some of these brushmen have spent years in this hermit-like existence. Not long ago one was known to be living at the headwaters of Bluefish River. His cave was seen and the tracks of a woman he had captured (for women's tracks toe in). But now he and all the other brushmen are dead.

There was one feature of their lives that all brushmen grew to find intolerable and that was the solitude. The very silence and peace which at first had been so welcome grew in time to be unbearable. The brushmen would creep close to a camp and listen to the people talking, people who, perhaps, they used to know. They would hide near a trail and, when a young woman passed, they would give a short, sharp whistle, unlike the cry of any bird or animal, hoping she would come to investigate, and then they would attempt to kidnap her or perhaps merely try to persuade her to go with them. All the young girls were afraid of the brushmen, and so, when Balaam's mother saw this figure hunched over the ground squirrel's hole, she was glad to discover that it was only a wolf.

Julia's great-grandfather was called *vi-kwa-tl*, "lots of brush". In the spring he hauled a toboggan with his grandmother on it. When he got to camp, he found out that his wife was living with another man. He was worried but would do them no harm; so he wandered off into the brush. Eventually he grew afraid of all people and always stayed alone in a cave and became a regular brushman. He killed caribou and moose, tanned the skins, made bone grease, and used all these to trade with white men. His people always had liked him and tried to induce him to return, but he was afraid of them. They would camp in open places so that he might approach them openly. They even tried to surround him, but he ran fast to the tops of the high mountains.

One day they determined to catch him, and three fast young women ran after him, shouting to him as they ran. He was so scared that he ran even faster than they could. This was in summer, in hot weather. They determined to run him down, sweat or no sweat. He grabbed handfuls of wet moss without pausing and cooled his head as he ran, and they never did catch him. This time he stayed away for a very long while.

Another time, they tried again to get close to him. He had a little boy, just old enough to crawl, and they thought that the sight of the child might bring him back. The brushmen feared an ambush and that there was a man concealed near the child. He called out, "There is still too much brush," and that is how he got his name.

They didn't see him for a year after that, and they assumed he had died somewhere back in the brush.

Not far up the Porcupine River from Old Crow lived an old man with two wives, and one day the brushman showed himself to them suddenly by crawling along under the water. Gradually he grew confident and visited the old people again. One of the two old women was a medicine woman. One day the brushman killed a beaver for her. They cooked it, and all sat down to eat. They served him a portion, and his piece suddenly turned raw. It was evident that somebody was working medicine against him. "Put it back in the pot," he said, but it turned raw once again, and then he knew that he had not long to live. He left the old people, and they saw him crawling away down the river. He dug his own grave but died beside it, not actually in it, and they found him lying there.

In those days white traders used to come up the Porcupine River with food. Five miles below New Rampart House, on the left bank going

down, there is a high white hill. Here he would sit and watch for the traders' boat. When he saw one coming, he would place all his goods on the shore, tied up in bundles. Then he would go back up the hill, and they traded by shouting back and forth. For each bundle he would ask for what he needed, such things as tea, sugar, flour, tobacco, and that is how he used to get his food and ammunition. He also used to ask for old Hudson's Bay Company braided belts and the coats with a peaked hood.

Once there were two old women who sat drying fish at the traps while the rest of the people were up in the mountains. All through the summer they were troubled by three brushmen, one of them a little boy. One day, while one of the old women was dozing over her fish cleaning, a brushman crept up and stole a little knife out of her heedless fingers. On another occasion, one of the brushmen crawled along, mostly under water, till he reached the fish traps to steal some of the fish in them, but one of the women saw him and hit him on the head with a priest.¹

Later in the year, when the people had come back from the hills, they decided to leave that camp. One of the younger men sat down to rest on top of a rounded knoll. All was quiet, and suddenly he heard the sound of laughter. He looked about him expecting to see some of his own people, but nobody was in sight. He kept very quiet and soon he heard people laughing again and somebody saying, "Do you remember when I slid the knife out of the old woman's hand?" Very quietly the young man went away and rejoined his people. They were living in opposed pairs of caribou-skin tents. In those days, when a man or woman had seen something unusual, they would say nothing until their silence was so evident that people would ask what was the reason for it.

This evening the young man neither spoke nor ate, and the people in both tents noticed it. That night he pushed his father to wake him up and told him what he had seen. Next morning, when the people were ready to go on, the old man announced that his family was going to stay behind for a little while to snare rabbits.

As soon as everybody had gone on and all was quiet, the old man went and sat on the little knoll; for a long time nothing happened and then he, too, heard laughter and talking. Suddenly he called out aloud, "Help! Please help me! I and my family are starving!"

At once the sounds of talk and laughter stopped. For a long time both the old man and the invisible people kept silence. Then he called again for help, after hearing them laughing and talking again of the old woman's knife, and added that there was nobody there but his wife and son and himself.

Soon he heard the sound of wood on wood and a small section of brush in the side of the little knoll moved aside and three brushmen appeared. They gave the old man and his wife and son food, and they all stayed together until the snow started to disappear in the spring. Then the man and his family went on and rejoined their own people.

Brushmen were always good to poor people.

One day the people were all in a big camp, and one man, when he was hunting in the hills and mountains, found a faint trail and followed it. All at once he saw someone in fine skin clothes with a bow and arrows.

¹ A short, heavy club used for killing fish.

It was a fine big woman. He hid and watched her from behind some brush. Suddenly she saw him, right there in front of her. She was so scared she nearly fainted. They just looked at each other. She sat down and stared. The man said he was hunting and came from a big camp. She didn't say anything about herself.* The man said he would not go back because he wanted to marry her. This was all right for her, so she led him back to her cave. He was astonished at all the good things she had and asked if she were alone. She said she was and that years before she wandered away, from sorrow. He saw all the sheep and caribou and moose meat and all the tanned skins. The man forgot about his people and stayed there.

(*Variant version*)

*He just said, "We'll get married." She agreed, and he went back to his own camp. She left her cave and came back with him. Soon it was winter, and they were out of meat and nearly starving. The woman had said little since they were married and seemed to be sick. They could not make out what was wrong. She always seemed to have something on her mind. As they travelled, the country suddenly seemed familiar, and she recognized it. This was where her cave was. They just happened to camp close by. She was laughing and singing, and they wondered what was the matter with her. When camp was made, she told her husband all about herself and that she was a brush-woman and her cave from which he had taken her was close by. "Let's go and see if everything is fine yet." A little handful of willows was pulled, and it was the door to the cave. Just inside was a large birchbark dish with bone soup in it. She dipped into it, for it was cool and fresh in the cave.¹ She ate pemmican too, and so did he. He couldn't believe she had killed all this game. After they had had a feed, they went back to the camp with a load of pemmican and other food. She had "wild rice"² and ground squirrel meat. They used a toboggan of moose legs and loaded it with dried caribou tripe to eat first. When they got back to the camp with this load, he cried out, "I have news to tell you that last year I found a woman who was worried all the time. She just led me back to her cave. All was safe yet and no animal has touched it. There is food for all." They were all glad, and some of them cried because they had lost relatives through starvation. Next day they all had meat enough to last till the snow melted. That is the end of that story.

One winter a brushman made a needlecase belonging to a young girl disappear by his medicine. These people happened to camp close to this brushman's cave on the edge of a lake with a hill behind it. He made her drop the case, and she didn't miss it until they had reached the next camp. When she missed it, she went back to the old camp to get it. When she was in the middle of the lake, he made a bad storm come up. She couldn't see because of the thick snow. Suddenly she heard a noise beside her; it was the brushman. He grabbed her and took her to his cave. Her people knew there was something wrong, because she was so long in returning. When they went back to look for her, there was nobody in sight. They cried and called, and she could hear them; the brushman told the girl that she should go back to them, as he was sorry for them. But she didn't want to, because he had three rooms in his cave all full of good meat, berries, bone grease, dried food, and so on.

She wanted to stay with him; so he let her stay, and her relatives gave up the search. A year later the brushman made some big hunting snowshoes, as large as six feet long, and by this time the girl was ready to lace them with babiche. Just above the cave was an open place covered with snow. There was snow under the snowshoes too, so she could see to work. The brushman had to stay hidden. Suddenly she saw a shadow

¹ So the soup was still fresh and good.

² Probably *Fritillaria* sp., a lily bulb.

pass over the snowshoes, and then it was repeated. She said, "Look at this, as though somebody was passing the cave." The same people who had lost her the year before had returned and were starving. They were on the same trail again and were walking with sticks, because they were so feeble.

The brushman said, "Maybe they are without food. I can tell by the way they are walking." In these days there were lots of people, two or three hundred. She finished the snowshoes at once, and he put them on. He told her to get food for them so that he could go out to feed them. He carried a full caribou skin of pemmican for them. He put this on his back and followed along their trail. He got to where they had made a camp, just a little place, because they were so weak. The brushman stopped on the edge of the camp and cried out, "Folks, is my father-in-law here? If you have lost a girl here, it was I who stole her. If her parents are here, let me know." As soon as they heard this, the people all ran up to him, and there among them was her father, who called out thanks for news of his daughter's safety. Three men were unable to carry all the food the brushman had brought. Each one got a piece about four inches square. They drank a soup of dried caribou tripe first. He told them to go back to the lake, the next day and he would give meat to each family. He told the girl that her parents were among the people, and the next day they all came to his cave, and he gave everybody enough meat to last until spring, and even then he had plenty left of all kinds.

Then he joined his father-in-law and lived with him, but he was so used to being alone with plenty of food that he could not stay. One morning he had gone, back to his cave perhaps. That is the end of that story.

When Julia's mother was young, she and another girl were going to the top of a hill near their camp to trap ground squirrels. An old woman who had stayed in camp that day happened to look up, and she saw two brushmen crawling through the brush trying to kidnap the two girls. She made signs to them to return to camp, which they did without knowing the reason. The old woman also loosed the dogs, but the brushmen quieted them by medicine. The two girls were very nearly stolen by the brushmen.

Another family was staying there the next summer, and, though they did not see the brushmen, they heard them whistling and so on. This family consisted of a widower and his two orphan sons. They set traps for ground squirrels and ground hogs, and sometimes the brushmen would leave a stone in the trap and sometimes they would take the dead animal out of the trap and leave it lying alongside. Perhaps they were trying to make friends.

These two boys were not scared of the brushmen and thought they would play a trick on them. They disliked having their traps touched, and they were hungry. Once they caught a man fooling with one of their traps. He was dressed in tanned skin clothes. Silently they crept up on him, and, as there was nowhere for him to hide, the brushman ran away. One of the boys shot at him and heard a scream but didn't bother to find out whether he had killed him or not. They were never disturbed again.

They came to the conclusion that this man was the son of a woman who had been stolen by a brushman many years ago when the tribe was moving camp.

Once a woman was kidnapped by two brushmen. They pulled her a long way till they came to a river and had to build a raft. While the two men were busy, she filled her dress with stones. Each time the raft was ready she stepped on it, and she was so heavy (because of the stones) that it was obviously not safe. "You'd better get more logs or we'll all be drowned," she said. Again she loaded herself with stones till she could barely move, and she was so big she looked to be pregnant. At last the men finished a big raft and still no help had come for the kidnapped woman, though she had delayed as long as she could. She told the two brushmen to get on the raft first, so as to help her on, and when they were there she suddenly gave it a big shove. The two brushmen had built the raft just below a riffle so that it would be carried quickly from the shore. Just that happened. The girl jerked the slipknot in her belt. All the stones fell out of her dress, and, light as air, she turned and ran up the bank. The last she saw of the two brushmen they were on their huge raft in midstream in the midst of a violent argument. She ran and ran day and night, until she got home.

GUARDIAN SPIRIT

Informants were reluctant to discuss puberty experiences in search of a "guardian spirit." However, random comments were noted, and it became apparent that one's particular contact with a guardian spirit was through the medium of dreams, and people spoke of "sleeping to" or "dreaming to" their spirit helpers. It was considered inadvisable to discuss one's guardian spirit or to call upon it for assistance on trivial occasions. The following notes are relevant to this topic.

Culture Hero

In the old days all animals were as large as men. Tatiokich was the man who made their dispositions and habits. It took him a long time. Of the wolverines, he killed all but a little female who ran up a tree. He tried to force her down by fire, but she urinated and put it out. He said that he would keep her small forever, but she answered that she would always destroy caches and spoil all man's possessions.

One of Tatiokich's camps is still to be seen on top of the Ramparts on the lake half-way between Old and New Rampart Houses, along the Porcupine River.

In those days Otter was a very mean animal. She was like a big woman, and when Tatiokich fixed her she became an otter. Whenever she found a man, she "camped" with him and all these men disappeared. She would show herself a good worker, always tanning skins, but they were human skins. Tatiokich wondered why all these men disappeared, and he tried to find out. He watched her every move.

After she had finished her work, she made a little bed and went to sleep. When she was asleep, he brushed her gently with a willow wand. He felt something touch it and saw an otter tooth-mark on it. Then he

knew that she thought it was this man after her. He lay down beside her and touched her again with the willow wand, and it was bitten off with the same tooth-mark. He was a very smart man, and he knew right away what she was doing. He grabbed a big stick beside her and slapped her over the belly. Immediately she gave birth to a young Otter, and then to Mink. As Mink came out, Tatiokich marked it with charcoal. Marten came next, and he marked him with it. Next was Weasel, who was almost too quick for him, but the charcoal tipped his little black tail. Red Fox he marked with the red stone used for making paint. He told them they would all remain small as they were and as he had marked them.

The last heard of Tatiokich, he went "outside" and all over the world and fixed everything up.

When a man breaks his silence as to what his medicine is, his servant is hurt as well as he.

A man with the same medicine as another would know or suspect that they both had the same servant.

The strength of one's guardian spirit was dependant on the man and not on the animal.

One must not kill, or eat the meat of the animal one "sleeps to." Lucy's grandmother "slept to" a bear. One day, while she was asleep, her children made a bannock with bear's grease instead of lard. When she woke up they gave her a piece of it without comment, but she recognized it at once and threw up.

One man had "wood" as his medicine and was prohibited from cutting it. His wife cut all the wood they used, and people, not knowing what was his medicine, always teased him about making her do all the hard work. At last, tired of being laughed at, he cut down a standing tree. Immediately he began to bleed from the mouth. Every time he cut again, the blood started to flow again.

As soon as a child was born, in the old days, it was laid at the door of the tent. All the animals (in the spirit) passed before the child, each hoping to be chosen as its "servant" or "guardian spirit." The child might or might not select one of them, and the parents had no way of knowing what animal or object was the child's servant.

Five men were hunting and surrounded what they thought was a moose. One man was aiming just as the "moose" waved his arms to show he was a man. His name was Jitree, which means "heart." The man who was aiming pulled the trigger anyway, and he wounded Jitree, who said, "Throw me in this pool and put a blanket over me and, no matter what you see or hear, don't touch the blanket."

Soon they heard the noise of beavers chewing and slapping their tails. One man came up and threw off the blanket. They saw a number of young beavers chewing at Jitree's wound, curing it. They all dived into the pool and disappeared. Jitree cried aloud, "My friends, you have killed me now. I'm gone." The beaver was the animal he "slept to."

SHOWMAN

The "showman" differs from the guardian spirit and appears to be a familiar whose chief function is to predict the future or to give warning of impending events. Various informants spoke quite casually of somebody else's showman and seemed to attach some validity to the predictions so received.

I am not clear as to the origin of the word. It may be used in the sense of one who performs tricks of magic, a conjuror. It is sometimes pronounced "shooman," and this may be a trace of the Scotch accent which some of the older Indians have. In the old days, when the Hudson's Bay Company was a more important factor in the economics of the northern Yukon, the various "Houses," such as La Pierre's House and Rampart House, were pronounced "hoose." Another complexity arises from the fact that one of these houses, now abandoned, is known as Schumann House, and whether this spelling and pronunciation are to be traced back to a German settler or not, I could not discover.

Steamboat is said to have a good showman and knows if death is coming to someone. Sometimes he has a twitch in his arm which he calls "somebody shooting on me," and it means there will be game to shoot. He is also able to forecast the death or recovery of patients. He says that his nose twitches to the right to foretell recovery and twitches to the left and turns cold for death. On one occasion, when I asked him if his showman was working well, he denied having a showman. A few minutes later, as I turned to leave him, he called me back and said that his showman was working now and foretold that I should return safely to Ottawa. On a previous occasion he had heard a whistling sound in the bush, meaning bad news. But he explained that this was not *ichndi*, "a showman", but *noquaan*, "a ghost".

Emma, an old woman, is reputed to have a very good showman. She foretold the death of a twelve-year old boy in the village and expected more trouble in the same family. She knew of the disappearance of a white woman at Fort Yukon, 150 miles away, a mystery which has not yet been cleared up.

Effie has a showman which takes the form of the twitching of an eyelid or eyebrow; the left eyebrow means a stranger is coming. A twitching in the right shoulder indicates the task of "packing" (carrying a load with packstraps); a long twitching down the right leg (said to run like a dog team) means the approach of a stranger; and a similar twitching in the left leg means bad news. On one occasion her right eyebrow was twitching, and she said, "My showman is working well." It meant that some event was in the offing, caribou or a stranger coming. She says that if you talk about your showman it gets weak and unreliable. She once made that mistake herself. If you say little about it till middle age, it gets strong.

Towards the end of my stay, Balaam told me that he had heard that a plane was expected from Fort Yukon. He added that two people had told him this and that his showman (in this case a bad taste in the mouth) did not protest on either occasion. He says that when people go up into

the hills to hunt caribou and make a fire, and the smoke of it is visible to him, his showman will tell him whether they have killed a caribou or not. The fire might mean that they are drying meat, or merely that they are making tea, but his showman enables him to know the actual truth.

MAGIC

Years ago there was a powerful medicine man. Sometimes, when there was no food and the people were starving, he would light a big fire and his family would all sit round it while he sang himself into a trance. Suddenly he would reach out and throw his arm into the snow and drag out a fat caribou which they would eat.

When Archdeacon McDonald was teaching the people in the early days, he was disturbed by noises from the next tent. They were caused by a medicine man in a trance. McDonald was going in to stop him, but the people restrained him, reminding him that he taught, 'Thou shalt not kill,' and telling him that if he touched the entranced man he would certainly kill him. The Archdeacon decided to wait and see him later. He would berate all people who went by their dreams, holding a court of inquiry and telling them to forget all such practices.

Frank Foster (a white resident) said that local Indian boys will pay Balaam a marten skin if he helps them to be successful at poker, for instance, an arrangement which requires but little, if any, effort on Balaam's part and in which he cannot lose. Foster remembers a steamer's being stuck twenty-five miles below Dawson. Two Indians came on board, and one of them told the Captain that he would bring the water up two feet for a consideration. The Captain sent him back to his camp to fetch his "tools," and the Indian spent the entire night on the gravel bar, huddled over a small fire into which he threw a powder which produced a blue flame. In the morning the water was even lower, but the Captain gave the Indian a sack of flour anyway, because he had tried so hard.

Another medicine man had told an Indian that he knew his life to be in danger and that he could save him in return for a mink,—not merely a skin, but the whole animal. The Indian whose life was in danger brought the mink, and the medicine man cut out its liver and began to rub it slowly into his patient's hair. For ten minutes or so he rubbed and massaged and at last announced suddenly, "Here it is!" and produced a .30-30 bullet.

A belief in magic seems to be held by most people and considered a normal part of everyday life. There are numerous references in folk-tales to the magical powers of various individuals, and, in the old days at least, people were careful to offend nobody lest they unwittingly anger a powerful magician who might revenge himself upon them. It was said that the medicine men were the really decisive factors in tribal warfare, no matter how strong physically the men engaged in combat might be.

Some medicine men were able to work on women through their dreams so that no children would be born to them.

Eliza's grandfather was reputed to be a powerful medicine man.

DREAMS

A dream is *kuinuilya*. Everybody dreams, but not all dreams are significant. Swift water means a storm, for Effie. If it is in a canyon, a snow storm is predicted. Some dreamers are more believed than others. One old woman hears noises like thunder and then gets news from the direction in which she heard it.

Julia says she goes by her dreams a great deal. Whenever she dreams of water, it rains the next day. She has never seen a zebra except in pictures, yet she has dreamed of them three times. They wanted to "come to her" (as her servant), but the feed and climate in this country are not suitable for zebras.

Whenever anybody in the village is going to die, she dreams of elephants, another animal she has seen only in pictures.

OMENS AND PREMONITIONS

Effie says many people here, when near death, see their dead friends and relatives. For example, a boy who died recently saw the late son of the chief.

When a fox makes a lot of noise, it's a sign of news coming—something will happen.

Ptarmigan never light on a house. If one does, or on a cache near, something is going to happen. The same with an owl. An owl lit on Effie's house two or three months before her son died. He had not been well all summer.

One woman heard a *noquaan* (in this case a heavy breathing) one year before her husband died.

White sun dogs in winter mean snow. Red ones mean cold weather.

PHILOSOPHY

People to-day say that all the trouble and sickness of to-day was foreseen and foretold by the old people in stories.

Joe Kay is a survivor of an epidemic when many people died. All the people were mourning and keening and outdoing each other in extravagant grief. It was winter and some ran naked in the cold, and others tried to tear down the house. While all this was going on, Keith was quietly eating fish pemmican, though there was little food left. When they reproached him, he answered, "I ate and feel well. If you would do the same, you would feel well too."

MISCELLANEOUS

The Sucker (a fish) once stole an old woman's rabbit skin hood, which he still wears, and a lot of caribou bones, still on top of his head, and the quills from the porcupine, which is why he is full of bones to-day. One of the bones in his body is a canoe paddle which he once stole. He also stole a woman carrying a baby on her back.

Not long ago a woman happened to have a little baby which she was carrying. At the same time her dog had a pup. They were travelling, and so the bitch was too busy to nurse the pup. The woman nursed the baby with one breast and the pup with the other. This baby girl from then on would eat dog bones and would always be careless, with her pants hanging down. They would tie her up, and she would bite through the thongs. She could hear well but never learned to speak. It is not known what became of her.

There are strange animals with horns, something like moose, very large, in the lakes, which people saw long ago. Something like rhino or hippo, in swampy places. Nobody ever shot one, because they were afraid of them.

RELATIONS BETWEEN RELIGION AND GOVERNMENT AMONG THE LONGHOUSE IROQUOIS OF GRAND RIVER, ONTARIO

By Marcel Rioux

In modern times, the religious divergencies within a reserve have often been the cause of friction and misunderstanding among the Iroquois themselves; this is especially true of reservations where both Christian and Longhouse Iroquois are living and practising their own religion. The religious rift had a tendency to extend to other cultural complexes and to divide the reserves into a few bitterly opposed factions. The Six Nations Reserve of Grand River, Ontario, is a good example of the difficulties which were met by the Iroquois. On this reservation, the six component nations of the Iroquois are represented, and the followers of Handsome Lake, the Seneca prophet who, around 1800, founded a new religion, number about 1,100 individuals out of a population of 5,500. The remaining four-fifths are Christians of various Protestant denominations. In this connection, Noon writes: "Differences in religious affiliation divided the chiefs into factions which caused them to oppose each other on many occasions".¹ He continues, "... The quarrel between the opposing religions struck at the very heart of the Confederacy. The Longhouse was a common symbol of both government and religion; the symbols relating to chieftainship and the concepts in which they were couched have real significance only to a Longhouse follower." He further adds: "Our discussion [with his informant] of the conflict between the Christian and Longhouse chiefs paved the way for an understanding that government and religion were probably interlocking institutions in pre-contact society." That frictions existed between Christian and Longhouse chiefs is a fact which could be corroborated even to-day by older informants. Hilton Hill, for example, states that the Longhouse chiefs would have liked to have been installed in the Longhouse² itself in order to give more prestige to their religion in the eyes of their compatriots. On the other hand, the Christian chiefs insisted that religious and political affairs be kept separate. There existed and still exists a tendency among the Longhouse chiefs to consider the Christian chiefs and the Christian Iroquois, in general, as traitorous to the Iroquois cause and responsible for the collapse of the Confederacy and the decadence of Iroquois culture. These divergencies account for the state of uneasiness that characterized the Six Nations Reserve in the years preceding 1924, when the Canadian Government decided to abolish the hereditary Council of the Chiefs. But what I want to discuss about Noon's statement, quoted above, is his conclusion to the effect that in the pre-contact period, religion and government were "interlocking" institutions. There is certainly room for differences of opinion on this matter or at least room for more arguments in favour of or against this opinion. Noon himself admits that his opinion would be contested by J. N. B. Hewitt, a great Iroquois student, who states: "In Iroquois polity there was definite separation of purely civil from strictly religious affairs. So the office of civil chief was clearly marked off from that of

¹ Noon, John A. *Law and Government of the Grand River Iroquois*. Viking Fund Publications in Anthropology, No. 12, New York, 1949, p. 45.

² Longhouse is used here to designate a follower of the Iroquois reformer, Handsome Lake, and also, the building where individuals of this persuasion hold their religious gatherings.

prophet or priest, and in so far as an incumbent was concerned it was the gift of the suffrages, of a definite group of his clanswomen, and so in no sense was it hereditary. The office was hereditary in the clan and, strictly speaking, in some family line of the clan. The civil assembly or the council of chiefs and elders or senators was in no sense a religious gathering, notwithstanding the custom of opening it with a thanksgiving prayer in recognition of the Master of Life—a strictly religious act. The officers of the religious societies and assemblies were not the same as those who presided over the councils of the chiefs.”¹ Noon comments that “Hewitt probably protects himself by the use of the qualifying adjectives, strictly and purely.”²

Noon’s opinion is principally based on observations made on the modern Six Nations Reserve and is inferred from contemporary phenomena. Is it possible in studying the actual ideal and behaviour patterns concerning the relations of church and government to infer what these were in pre-contact Iroquois Society? Although our study of the Iroquois Longhouse followers of the Six Nations Reserve was made with a view to determining the present state of acculturation, some hypotheses concerning the ancient culture could also be inferred from it. The observations to be made here concern the Longhouse Iroquois who, more than their Christian compatriots, have kept intact their aboriginal culture. It is to be noted, however, that the religion the Iroquois practised in pre-contact society and the one a minority is practising nowadays—The Handsome Lake religion—differ in many respects. It is not the same formal complex continuing through history; the reformation of 1800 has adapted the surviving elements of the old religion to the conditions imposed upon the Indians by the dominant Anglo-American culture. If we compare what we know about the ancient religion with the Code of Handsome Lake, which is actually practised on modern reservations, we arrive at the conclusion that we are dealing with nearly two different religions. As Voget says, “The worship [the actual Longhouse religion] is a compound of native and Christian forms, functions, meanings and principles.”³ The point I want to stress is that not only the religious forms (what can be observed and described) have changed but also the functions, uses, and meanings of the religious complex. From what is known of the ancient culture, it could be inferred that religion was not the cultural focus of the Iroquois culture and that the political and social organization was certainly a complex of greater importance than the religious one. The reformation of 1800 has given greater importance to the religious complex which became the focus or the basic orientation of their life. The centre of interest shifted from political and social organization to religion. It then became the means by which the ancient Iroquois culture was to be restored, and a return to their cultural golden age was to be made possible through it. Their political aspirations and revendications crystallized around this new religion and made it a very important element of their whole culture. If it is true that the process of secularization has been accelerated during the reservation period because of contacts with the Euro-American culture, the formal religion, which is but an aspect of the

¹ Hewitt, J. N. B. *Constitutional League of Peace in the Stone Age of America: The League of the Iroquois and its constitution*. Smithsonian report, 1918, p. 543, Washington, 1920.

² Noon, John A. *Ibid.* p. 47.

³ Voget, Fred. *Acculturation at Caughnawaga: A note on the Native modified Group*. *Am. Anthropol.*, Vol. 53, No. 2, p. 226.

domain of the sacred, has gained a greater relative importance than it had in pre-contact society. All this tends to show that one must be careful when studying the relations of church and government in both these periods of Iroquois history. It could be argued that even if the forms, functions, and meanings of a religion change in the course of history, the basic principle governing the relations between two complexes remains relatively stable. My purpose here is to show that even within the conservative Longhouse group of the Six Nations Reserve at Brantford, Ont., there exist differences in the ideal and the behaviour patterns concerning the relations between church and government.

Viewed somewhat superficially and in an evolutionary perspective, this problem could be handled in the following manner: on the one hand, the differences between the progressive Christian Iroquois and the so-called reactionary Longhouse group might be considered a step towards greater secularization, because it is generally true that as a group evolves it becomes more secular. The same principle might also explain the differences within the conservative group itself, where the more evolved would supposedly be more secular and the more "native" more sacred. In other words, following Voget's classification, the "native-modified" group would represent a step further in the process of secularization, in comparison with the state of the "native" group. Unfortunately, I do not think that the facts justify the hypothesis of such a unilinear scheme of evolution.

The two sub-groups of the Six Nations Reserve studied here in connection with their ideal and behaviour patterns concerning the relations between the church and the government, are the Lower Cayugas and the Onondagas or, at least, the followers of these two Longhouses. The lower Cayugas actually represent the more numerous and cohesive group of Longhouse adherents on the Reserve. In terms of Voget's classification of the Caughnawaga Indians, it is certainly in this group that the native culture is better represented, and if we consider the Cayugas a group by themselves, the designation of "native" fits them better than any other group or sub-group. The Lower Cayugas represent more than half of the 1,100 Longhouse followers of the Six Nations Reserve. From the point of view of their mentality and their technical as well as non-technical culture, they may be considered as the best-preserved group. Acculturation processes are at work among them as well as in the other tribes or sub-groups on the Reserve, but their rhythm does not seem to be so marked as in other sections of the Reserve. One of my informants—an old preacher of the Lower Cayuga Longhouse—told me time and time again that government and religion were two different things and that they should not be mixed. "The Longhouse is our church, and all religious matters should be discussed and handled there. The chiefs have nothing to do there; they are just ordinary people when it comes to religious questions." At first it seemed that this particular informant, having been refused for the position of head-chief of his family, even though he had been a second chief for a number of years, was moved by spite and that he tried to lower the status of the chiefs. For this reason, his opinion was checked up. A number of persons, although not so emphatic, stated their conviction that church and government were two different things which should not interfere one with the other. At the Little Green Corn Festival, I took the names of all who had anything to do with the Longhouse and checked the names of

chiefs or of persons whose families held chieftainships. I found that most headmen, preachers, workers, and helpers of the Longhouse consisted of persons not connected by political affiliation with the hereditary system of chiefs. Doubtless, there are a few individuals among the Longhouse officials connected with the political chiefs, but it does not seem to have been a factor in their being chosen for these positions.

The Onondagas, on the other hand, are not very numerous, but they are very active. The refusal of the Canadian Iroquois to recognize the Federal Government and their resistance to being euro-americanized centres specially around the Onondaga Longhouse. When compared with the Lower Cayugas, they could also be labelled "native" but with a difference, which does not lie so much in the contents of their behaviour as in the emphasis they put on their Indianness. Their ideal and behaviour patterns concerning the relations between church and government differ from those of the Lower Cayugas. Leaders of the Onondaga Longhouse often state that you cannot retain one without retaining the other and that the Iroquois religion without the proper political body (Council of Hereditary Chiefs) is impracticable; the two complexes are so interwoven that they feel that, if deprived of one of the two—as the Canadian Government has done in 1924 by abolishing the Council of Hereditary Chiefs—their culture is destroyed, and the religion itself cannot be properly practised. This argument is often put forward by the leaders and the chiefs of the Onondaga Longhouse in support of their claim for the return of the Council of Hereditary Chiefs.

In checking the list of the officials of the Onondaga Longhouse, it became evident that the civil chiefs predominate and are in full control of it. At the Little Green Corn Festival, an old Onondaga stood up and declared publicly that in that Longhouse it is the chiefs who are in power. "We do what the chiefs tell us to do; they decide and we obey." He then asked the crowd gathered at this meeting to always follow the advice of the chiefs and to place their confidence in the Iroquois Confederation, because their whole religion was based on it. At this festival the headmen of the Deer and Wolf clans were represented by the two highest Onondaga chiefs, Thadodahro and Honehweyehdehs.

How may these differences be explained, and what is to be inferred from them concerning the status of church and government in pre-contact Iroquois society? The two sub-groups living side by side and having gone through the same historical circumstances are about at the same acculturation level; outwardly, i.e. from a behavioristic view-point, there is not much difference between the Lower Cayugas and the Onondagas. If a "native" group means that "the basic orientations of the individuals are in terms of the unmodified aboriginal past"¹ and if the terms may be applied with some restrictions to both these sub-groups, I would say that the Lower Cayugas are *traditionally* native, while the Onondagas are *consciously* native. This distinction is intended to convey the idea that the Lower Cayugas do not make so much effort to preserve their Indianness; they are Iroquois like Americans are Americans; they do not feel the pressure of the White culture so much as the Onondagas. Being a more numerous and a more homogeneous group, they think and act in terms of their basic Indian orientations without considering too much what the others

¹ Voget, *ibid.*, p. 221.

think and do; they are more unconsciously Iroquois than their Onondaga brothers. The latter group, on the contrary, is more aggressive and more hostile to the White culture; they feel the menace of the dominant culture, they verbalize and rationalize their feelings and ideas and make explicit their basic postulates; on the whole, their self is more integrated than that of the Lower Cayugas. Both groups might, in the last analysis, stand for the same ideas and principles, but the Onondagas and their followers will be more apt to defend them as a whole, in which everything is interwoven, while the Cayugas tend to present an atomistic view of their problems and their culture. Both the culture and the self of the two sub-groups might, in the last analysis, be as well integrated, but the postulates of the Lower Cayugas are less conscious and explicit than those of the Onondagas.

The split between these two sub-groups about the ideal and behaviour patterns concerning the relations of church and government probably took place in 1924 when the Canadian Government deposed the hereditary chiefs. It appears that the Lower Cayugas, as a whole, have accepted this situation more easily and have been more satisfied with it than the Onondagas; statistics show that they are voting in increased numbers at the elections for councillors. They did not see in the suppression of the Hereditary Council a threat to their Indianness like the Onondagas did, and they were not so active in their efforts to restore it. I believe that the strong statements uttered by some of the Lower Cayugas in connection with the separation of church and government are rationalizations of a state they have come to accept and are also made, in some cases, in reaction against the Onondagas, who link both institutions; they also react to a certain extent against the Mohawk workers—an organization of Christian Iroquois who are agitating for the return of the old Chiefs Council.

On the other hand, the Onondaga Longhouse has always been a centre of reunions for restoration of the deposed chiefs and their successors, who, although not recognized by the government, have continued since to hold meetings and to try to influence the political and social life of the Reserve. This resistance and agitation against the Canadian Government has caused them to outline expressly their basic orientations; this verbalization of motives and underlying ideas has helped them to find some principles on which to integrate the remains of their culture and has supplied them with new strength to combat the acculturation processes that are increasingly operating.

It seems difficult to decide, on the basis of the modern attitude of the Lower Cayugas and the Onondagas towards the ideal and behaviour patterns concerning the relations of church and government, which one represents the closer pattern to the pre-contact Iroquois society. It seems that neither of the two attitudes represents the pure aboriginal one; both are modified and are the crystallizations of different reactions to the same historical circumstances. In pre-contact society it would appear that church and government were interlocking to a certain extent, not so much as the modern Onondagas Longhouse would like them to be, but more than the Cayugas think they ought to be.

LE FOLKLORE ACADIEN

par Luc Lacourcière et Félix-Antoine Savard

En 1950, nos enquêtes ont principalement porté sur le folklore acadien de la région de Shippagan, dans le nord du comté de Gloucester, au Nouveau-Brunswick. Nous y avons fait deux séjours, le premier de six semaines, en juillet et août, et le second, de dix jours, au mois de novembre. Le nombre des informateurs rencontrés se chiffre par plus d'une centaine. Les informations et notes recueillies à la main ou sous forme d'enregistrement furent aussi abondantes qu'on pouvait l'espérer en une région où nous allions pour la première fois.

Mais auparavant que d'en fournir un aperçu numérique et analytique, nous voudrions donner quelques renseignements généraux sur le folklore acadien et sur les principales enquêtes qui en ont été faites. Ces renseignements relativement peu connus sont de nature à faire apprécier le travail déjà accompli par une quinzaine de chercheurs et à orienter ceux qu'intéressent les traditions françaises.

Les Acadiens de langue française dans les trois provinces Maritimes forment une population qui atteint 300,000 habitants. Cette population est rurale dans une proportion des quatre cinquièmes et vit surtout de pêche, d'agriculture et d'exploitation forestière.

Le plus fort groupe et le plus compact, près de 200,000, se trouve au Nouveau-Brunswick. Une trentaine de mille habitent le Madawaska et le haut de la rivière Saint-Jean, cependant que la grande majorité forme la population côtière des comtés de Gloucester, sur la Baie-des-Chaleurs, et de ceux de Kent, Restigouche, Westmorland et Northumberland sur le détroit du même nom et sur le golfe Saint-Laurent. Ailleurs se trouvent quelques petites enclaves acadiennes de moindre importance.

Dans l'Île-du-Prince-Édouard, la population acadienne est de 18,000, soit environ le cinquième de la population totale de l'Île, tandis qu'en Nouvelle-Écosse, elle est de plus de 75,000 habitants, répartis en trois principaux groupes: celui de la Baie-Sainte-Marie, celui de Pubnico sur l'Atlantique, et celui du Cap-Breton, lui-même partagé entre deux centres: Chéticamp et Arichat.

Au point de vue folklorique, il faut encore rattacher à l'Acadie certains centres de la province de Québec, tels que les Îles-de-la-Madeleine, plusieurs paroisses de la rive sud de la Gaspésie, quelques postes de la côte Nord du Saint-Laurent. (En outre, il y a quelques petites Cadies, véritables isoglosses, dans certains comtés intérieurs, tels Lacadie, près de Montréal, Saint-Jacques-l'Achigan, etc. . . . Mais ces derniers ont à peu près perdu au contact du Québec leurs particularités acadiennes.) En dehors du Canada, il y aurait à mentionner les groupes acadiens des États-Unis, dans le Maine et le Massachusetts et surtout en Louisiane, ainsi que celui qui au 18^e siècle a été rapatrié en France, à Belle-Isle.

L'éloignement et l'isolement relatifs des centres acadiens des provinces Maritimes et du golfe Saint-Laurent en général est assez grand et ancien. Il remonte dans certains cas à près de deux siècles. Il s'ensuit que toutes ces petites Cadies sont loin d'être uniformes. Les Acadiens

eux-mêmes perçoivent des différences, tant dans le domaine du langage que dans celui des traditions. Un pêcheur de Shippagan nous a fait des remarques curieuses sur la manière de parler des Îles-de-la-Madeleine. Il nous citait en exemple cette phrase d'un père ordonnant à son enfant de rentrer à la maison sous la menace d'une punition: "Va-t-en à la cahute ou je vas te rioter," et il ajoutait qu'il avait trouvé cela "drôle à entendre".

Au point de vue linguistique, il n'y a là rien de *drôle* ou de surprenant. Au contraire nous sommes en présence d'un cas très caractéristique des variations d'une langue chez un petit peuple que l'on pouvait présumer assez homogène, au temps de Louisbourg et de Grand'Pré, avant qu'il ne soit dispersé et n'ait refait souche en autant de petites Cadies canadiennes. (En 1755, la population de l'Acadie était de 15,000 habitants.)

L'histoire de l'Acadie, sa dispersion, ses regroupements divers et sa renaissance ont fait depuis longtemps l'objet de nombreuses études. Il suffit de rappeler ici les noms des principaux historiens: Rameau de Saint-Père, Casgrain, Richard, au dix-neuvième siècle, Lauvrière et Bernard, au vingtième. Leur œuvre nous a familiarisés avec la suite historique et démographique du peuple acadien. Ils le racontent bien dans sa durée, mais sans le définir dans ce qu'il a de plus caractéristique, dans sa vie au foyer, dans l'expression de ses pensées, de ses peines et aussi de ses joies, c'est-à-dire dans sa civilisation traditionnelle. Il appartient plus spécialement aux linguistes et aux folkloristes d'explorer ces aspects.

Le fait linguistique franco-acadien a toutefois depuis longtemps éveillé la curiosité attentive des romanistes. Dès la fin du 19^e siècle, il a été l'objet de travaux fort appréciables qu'il est bon de se rappeler. Ce sont d'une part de savantes études sur la langue de la Louisiane, dont la liste s'allonge de jour en jour.

Qu'il suffise de rappeler ici les noms d'Alcée Fortier, de J.-K. Ditchy et W.-A. Dorrance, et l'existence d'une quinzaine de thèses manuscrites présentées dans diverses universités américaines, françaises et canadiennes.

D'autre part, pour le franco-acadien du Canada, l'ouvrage capital reste celui de James Geddes, ex-professeur de Harvard, et s'intitulant *Study of an Acadian-French dialect spoken on the north shore of the Baie-des-Chaleurs*, Halle, 1908. Cet ouvrage méritait, en son temps, l'éloge suivant du juge Adjutor Rivard: "C'est le plus bel ouvrage de dialectologie canadienne et le plus considérable, et le mieux fait, et le plus consciencieux, qui ait encore paru."

Parmi les pionniers des études linguistiques en Acadie, il faut aussi mentionner le Sénateur Pascal Poirier. Bien que de formation moins technique que Geddes et Fortier, il n'en a pas moins pendant un demi-siècle accumulé des matériaux en vue d'un *Glossaire acadien*, dont quelques tranches seulement (les lettres A et C) ont paru dans l'*Évangéline* (1927-1928). Un linguiste d'aujourd'hui, le Père René Beaudry, songe à le reprendre en l'enrichissant d'apports nouveaux. A consulter aussi du Sénateur Poirier, le livre qui résume sa pensée et son expérience: *Le Parler franco-acadien et ses origines*, (Québec, 1928).

Plus récemment ont paru un certain nombre de monographies moins ambitieuses, mais non moins importantes parce qu'elles localisaient exactement les phénomènes étudiés. Ce sont plusieurs brochures d'Hector Carbonneau sur les Îles-de-la-Madeleine; un vocabulaire des mêmes Îles

par Paul Hubert; une étude linguistique et folklorique d'un conte populaire par Ernest Haden (*Archives de Folklore*, Vol. 3, 1948); une autre du même genre de Geneviève Massignon (*The French Review*, octobre 1947). M^{lle} Massignon doit aussi présenter en Sorbonne une thèse sur les parlers populaires acadiens. Pendant près d'une année, elle a fait des enquêtes dans divers centres d'Acadie sur la langue et les autres traditions orales, selon les méthodes employées pour le nouvel *Atlas linguistique de la France*.

De ces études linguistiques, encore peu nombreuses à la vérité, il ressort que l'Acadie, ou les Acadies, offrent une matière éminemment riche et un champ d'expérience profitable à la philologie romane. Les problèmes qui se posent à l'attention des linguistes sont en quelque sorte complémentaires de ceux des dialectes romans ou du moins français. Ceux-ci au cours des deux derniers siècles ont eu tendance à s'uniformiser, par contacts répétés, tandis que dans les Acadies, l'évolution a, en quelque sorte, suivi une marche opposée. L'examen attentif de ce phénomène peut éclairer plusieurs points de l'histoire de la langue française elle-même.

On peut en dire autant des traditions populaires du conte, de la chanson et des autres genres oraux qui offrent des cas pour ainsi dire uniques de ce que l'on "a entendu d'un ancêtre à l'autre", hors des écoles et de toutes directives officielles, comme nous le faisait remarquer un octogénaire. L'étude comparée des traditions françaises, que ce soit celles du Québec ou de France, aura toujours quelque chose de tronqué si l'on n'y ajoute les très riches, fidèles et archaïques variantes, perpétuées en territoire acadien. La preuve en est déjà faite, du moins pour ce qui a trait aux collections de chansons populaires dont nous voudrions dire un mot.

La plus ancienne, *La Collection Arsenault et Gallant* (circa 1923), comprend cent-dix chansons (textes et mélodies) qui toutes viennent de l'Île-du-Prince-Édouard. Elle est conservée au Musée national. Quelques pièces seulement ont été publiées par M. Marius Barbeau qui en fait l'analyse dans son *Romancero du Canada*, pages 184-186.

La collection Joseph-Thomas LeBlanc (1937-1941) est jusqu'ici la plus abondante. Une partie seulement, 87 pièces, a été imprimée dans *La Voix d'Évangéline*, de Moncton; les manuscrits comprennent quelque 1,500 variantes de 534 chansons obtenues de correspondants de toutes les parties de l'Acadie, mais principalement du Nouveau-Brunswick. LeBlanc n'avait pu recueillir que 131 mélodies. Il y travaillait ardemment quand il est mort prématurément en juillet 1943. Ses papiers originaux sont déposés aux Archives de l'Université Saint-Joseph, à Memramcook. Trois copies dactylographiées en ont été faites qui sont conservées, l'une au Musée national, l'autre à la Bibliothèque municipale de Montréal et la troisième aux Archives de Folklore. Cette collection a été minutieusement analysée et cataloguée par M^{lle} Gisèle Blouin dans une thèse bio-bibliographique de l'Université Laval, à laquelle nous avons emprunté les statistiques précédentes.

De 1942 à 1948, le Père Anselme Boudreault et le Frère Daniel, Capucins, ont publié trois séries de *Chants d'Acadie* qui totalisent 125 pièces provenant de la région de Chéticamp au Cap-Breton. Ces folkloristes sont encore actifs et réservent sans doute d'autres recueils. Sous le même titre, *Chants d'Acadie*, M^{lle} Laura Gaudet a aussi publié, en 1946, à New-York, un album de treize pièces, puisées uniquement dans sa tradition maternelle (Moncton).

Enfin, M^{lle} Massignon, lors de ses enquêtes linguistiques en Acadie, a enregistré assez de chansons populaires pour en faire le sujet de sa deuxième thèse, en Sorbonne. Son manuscrit reproduit 80 chansons choisies parmi une cueillette d'environ 300 variantes. Plus récemment (1948), un autre Français, M. Alfred Pouinard, notait au Nouveau-Brunswick une quinzaine de chansons qui lui ont servi dans sa thèse ayant pour titre *Recherches sur la musique d'origine française en Amérique du Nord, Canada et Louisiane* (Université Laval).

Nous ne sommes pas bien sûrs de ne pas oublier quelques collections acadiennes, la plupart des matériaux ainsi énumérés étant encore inédits. Par exemple, Madame Caron-Dupont fit des enquêtes pour le compte du Musée national, aux Îles-de-la-Madeleine, en 1948; et nous avons entendu parler d'une collection Juliette Gaultier, qui aurait été faite à Pubnico (circa 1928), sans qu'il fût possible d'obtenir des renseignements vérifiés. Toutefois, nous devons signaler, même rapidement, les collections acadiennes enregistrées en Gaspésie, parmi lesquelles celle de M. Marius Barbeau, quelque 400 pièces, (1923 et 1941); celle de M^{lle} Carmen Roy (depuis 1948); et une collection de 17 chansons que nous avons commencée en 1949.

Un inventaire complet devrait aussi comprendre les collections louisianaises. Nous ne pouvons que référer ici à celles de M^{lle} Irène-Thérèse Whitfield (104 chansons imprimées); de M^{lle} Irène M. Petitjean (*Cajun Folksongs*); de M^{lle} Corinne Saucier (71 chansons) formant partie de sa thèse sur *l'Histoire et les traditions de la paroisse des Avoyelles* (Université Laval, 1949); du Père F. Chiasson, 23 textes que M. Alfred Pouinard a incorporés à sa collection de 56 chansons acadiennes de la Louisiane (thèse citée). Longfellow, s'il revenait aujourd'hui, n'aurait que l'embarras du choix, au lieu qu'en son temps il lui a fallu puiser dans des recueils de France les quelques chansons qu'il mentionne dans son *Évangéline*.

Le domaine des contes populaires, tout en nous paraissant aussi riche que celui des chansons, ne semble pas avoir été exploré avec le même zèle. Il n'y a guère de collections considérables. Tout au plus pouvons-nous citer quelques textes épars recueillis en marge d'enquêtes linguistiques ou de chansons: Pascal Poirier, un conte publié; J.-T. LeBlanc, cinq contes manuscrits; Ernest Haden, le conte de *La Petite Cendrillouse*, publié dans "Les Archives de Folklore", Vol. 3, 1948; M^{lle} Geneviève Massignon: un conte publié et quelques-uns manuscrits; M^{lle} Marguerite Michaud, trois contes publiés dans *La Voix d'Évangéline*. Ces contes proviennent tous du Nouveau-Brunswick. En Nouvelle-Écosse, région de Pubnico, M^{lle} Hélène Creighton a noté, en marge de ses enquêtes sur le folklore écossais et anglais, quelques contes acadiens. Plus exactement, elle les a transcrits d'un journal local, *Le Petit Courrier*, où ils avaient été publiés par M. Désiré D'Eon. M^{lle} Creighton a aussi obtenu de la même informatrice que M. D'Eon les mêmes contes en anglais. C'est un cas curieux et probablement rare de transmission folklorique bilingue par une même personne.

Cependant c'est peut-être dans la Gaspésie que l'on a noté le plus grand nombre de contes acadiens. M. Barbeau, M^{lle} Carmen Roy et nous-mêmes en avons recueillis, chacun, plus que tous les folkloristes ne le firent en Acadie proprement dite. Notre seule collection personnelle en comprend 13.

En Louisiane, la cueillette des contes acadiens a été beaucoup plus active que celle des chansons. L'impulsion en a été donnée très tôt par Alcée Fortier qui publiait dix contes, dès 1889, et tout un recueil, dans les *Mémoires de l'American Folklore Society*, en 1895.

Plus récemment quelques auteurs ont fait des collections importantes. M. Calvin Claudel dont la thèse à l'Université de North Carolina, 1947, s'intitule: *A Study of the French Folktales of Avoyelles Parish Louisiana*, en a recueillis environ 70. Quelques-uns sont transcrits en caractères phonétiques. De leur côté M^{lle} Ariane de Felice, boursière du gouvernement français, notait 20 contes, en 1946, et M^{lle} Corinne Saucier, 29 provenant aussi des Avoyelles (thèse citée). M. J.-M. Carrière, l'auteur d'un important recueil de contes du Missouri, s'est aussi occupé des contes acadiens. Il a publié au moins une étude critique en collaboration avec M. Claudel. "Snow Bella: A tale from the French Folklore of Louisiana", dans le *Southern Folklore Quarterly*, septembre 1942.

Nous n'avons pas dressé de liste des matériaux recueillis dans les autres domaines du folklore acadien, bien que nous ayons trouvé chez plusieurs auteurs des documents épars sur les légendes, sur la vie matérielle et les mille et un détails de la vie populaire. Cela aurait dépassé les cadres que nous nous étions tracés ici.

Il nous reste à donner maintenant une idée de nos propres acquisitions folkloriques, dans la région de Shippagan, pendant l'année 1950. Elles ont porté sur le langage, la littérature orale, les mœurs et coutumes, bref sur la civilisation traditionnelle. Les notes linguistiques sont particulièrement abondantes, et par elles, l'on rejoint presque tous les points de la vie populaire, depuis les descriptions techniques de la pêche, des barques, etc., jusqu'aux costumes anciens et aux manières de nommer et de "caller" les danses. Le nombre d'expressions ainsi notées est très difficile à préciser. On se fera une idée de son importance et de son intérêt par le fait que nous avons enregistré une dizaine d'interviews de 20 à 30 minutes chacune avec des vieillards, dont une centenaire, qui évoquaient en leur style naturel et spontané leurs souvenirs de la vie ancienne. Nous jugeons ces mémoires de vieillards très précieux à un double point de vue: pour les sujets évoqués et pour l'étude de l'acadien oral. Tous les éléments du langage: phonétique, vocabulaire et syntaxe y sont situés dans un contexte et non seulement saisis au vol.

Nos enregistrements comprennent aussi 24 contes, 82 chansons et 4 reels. Sous forme manuscrite, nos carnets renferment une trentaine de comptines et formulettes, autant de devinettes, de jeux et de proverbes, de longues listes de blasons populaires, individuels et collectifs.

La seule énumération de ces items recueillis révèle la richesse du champ d'observation que nous avons choisi. En effet la situation des deux îles de Shippagan et de Miscou, ainsi que la péninsule de Shippagan, de Caraquet à Poquemouche, par son éloignement des centres urbains, par les genres de vie de ses habitants, est très favorable à la conservation des traditions. Toutefois cela ne signifie pas une absence complète d'influences extérieures. Nous avons déjà noté que plusieurs Acadiens s'étaient établis en Gaspésie. Parallèlement l'influence des Gaspésiens est sensible à Shippagan. Les pêcheurs des deux côtes familiarisent volontiers et plusieurs ont pris femme de l'autre côté de la Baie-des-Chaleurs. L'influence

vient parfois de plus loin encore, par l'intermédiaire des travailleurs saisonniers. Ainsi un de nos meilleurs conteurs de Pointe-Canot a travaillé pendant vingt-six hivers dans les chantiers de la province de Québec. Son répertoire s'est naturellement enrichi de nombreuses traditions du Saint-Laurent. Par contre, d'autres sont demeurés toute leur vie sédentaires.

Quant au choix et à la qualité des textes recueillis, ils offrent naturellement des similitudes avec les collections de chansons et de contes acadiens que nous avons énumérées. A peu près tous les genres y sont représentés, les berceuses et les complaintes, les chansons comiques, les chansons de travail et les chants religieux. Nous n'en nommerons qu'un exemple, en raison de sa rareté. C'est la *Nourrice du Roi*, dont on ne connaissait jusqu'ici qu'une seule version provenant de la *Collection Arsenault*. (cf. *Romancero du Canada*, pages 183-186.)

Il en est de même des contes qui se rattachent au répertoire universel, avec une prédominance des contes merveilleux du type de *Jean de l'Ours*. Nous en avons 14 de ce groupe. Les fabliaux ou contes comiques sont représentés par 8 pièces, alors que nous n'avons trouvé que 2 contes d'animaux.

Nous ne voudrions pas que l'on considérât ces remarques et statistiques comme représentatives de toutes les traditions de la région de Shippagan. Elles ne font que résumer une première saison d'enquêtes en Acadie. Car, en 1950, nous avons principalement jeté les bases d'une collaboration très prometteuse avec une population éminemment sympathique et accueillante qui a bien compris notre genre de travail. Et c'est la promesse de découvertes autrement abondantes, pour 1951.

RONDES ET DANSES À L'ÎLE-AUX-COUDRES

par Madeleine Doyon

De toutes les régions de la province de Québec où l'on a fait jusqu'ici des enquêtes de folklore, il n'y en a aucune qui semble avoir gardé plus vivantes et aussi intactes les danses populaires anciennes que l'Île-aux-Coudres.

Ce fait presque extraordinaire de conservation tient sans doute à la position géographique de l'Île. En effet, située à quelque soixante milles en bas de Québec, l'Île-aux-Coudres ne put pendant longtemps communiquer avec la terre ferme que par la seule traversée en canot, pénible en toutes saisons, et particulièrement en hiver. Aujourd'hui encore, malgré la présence d'un traversier qui, d'avril à novembre, prend une demi-heure à nous transporter au quai des Éboulements, les contacts entre les deux terres restent quand même limités et la population passe dans l'isolement une grande partie de l'année. Mais les habitants de l'Île s'en consolent en menant tout le long des hivers une vie de relations sociales intenses. Les familles des deux paroisses sont presque toutes apparentées les unes aux autres et se réunissent fréquemment l'après-midi et surtout le soir. Les veillées se passent en divertissements de toutes sortes dont les danses ne sont pas les moindres.

"Ici, tout le monde danse!" Cette exclamation, qu'on lance au cœur des soirées, revient sans cesse comme un leitmotiv, et caractérise bien la mentalité des insulaires. En effet, tout le monde, jeunes et vieux, est possédé par le démon de la danse. Un chanteur entonne-t-il un air de danse qu'immédiatement un gigueur saute au milieu de la "place" (du plancher) et se met "à froter" (exécuter des pas de gigue). Le signal est donné: on écarte tables et chaises, les couples s'organisent, et, en avant la musique!

Pour un enquêteur, l'expérience est extrêmement intéressante. A l'Île-aux-Coudres, dès que vous parlez danse, on vous donne spontanément une démonstration de danses *folkloriques*. Personne ne songerait à vous offrir une "samba" ou un "boogie-woogie", et pour cause! La population n'a encore que très peu été influencée par les rythmes américains. On connaît les mélodies jazzées pour les avoir quelquefois entendues dans les rares familles qui possèdent des disques ou un appareil de radio à piles, mais on ne les aime guère, les oreilles n'ayant pas encore pris l'habitude des mélodies syncopées. Malheureusement, l'année prochaine verra l'électrification de l'Île, et alors . . . pauvre folklore!

Il y aurait des remarques curieuses à faire sur les tendances endogamiques et exogamiques des insulaires. Nous n'en indiquerons qu'un point qui touche à notre sujet. En effet, nous remarquons des échanges fréquents de garçons entre les deux paroisses. Est-ce parce qu'ils sont fascinés par la nouveauté que, par exemple, les jeunes de Saint-Louis accourent chaque fin de semaine à Saint-Bernard, "la moderne", et participent aux danses qu'organise pour les touristes l'Hôtel de la Roche-Pleureuse? Est-ce parce que les jeunes filles de Saint-Louis sont plus aguichantes ou que leur nombre considérable permet des choix plus heureux que des garçons de Saint-Bernard conduisent aux veillées de danses du

samedi soir les jeunes filles de Saint-Louis? On ne saurait y répondre avec certitude. Quelles que soient les causes de ces courants sans cesse mouvants, il importe de retenir que c'est la jeune génération qui, à l'année, mène le branle. Si elle accorde sa préférence aux danses dites "callées", elle n'en connaît pas moins parfaitement toutes les autres danses traditionnelles locales et s'y livre avec entrain. La danse traditionnelle, à l'Île-aux-Coudres, est donc en pleine vitalité.

Nous avons pu observer, chez cette petite population de cent quatre-vingts familles environ une très grande variété de danses,—dont les unes sont fort anciennes,—qui pourraient se répartir en deux groupes: *a) les danses chantées* qui comprennent les rondes, la plupart des jeux dansés et certaines figures isolées de danses de groupes; *b) les danses accompagnées d'instruments* dont les principales sont les gigues, les "reels", le menuet, les quadrilles et les cotillons.

Quelques-unes des danses chantées, comme *J'entends le moulin* et la *Ronde des Cocus* ne sont tombées en désuétude que depuis peu. Un de mes informateurs, âgé de soixante-dix ans, a dansé les Cocus bien des fois, et il affirme que cette ronde satirique fut même très populaire au temps de sa jeunesse. Aujourd'hui on n'en a gardé que la chanson:

Les deux cocus sont rassemblés, (*bis*)
Sautent les cocus sautent,
Un par dessus l'autre.
On va chercher un autre cocu.

Les trois cocus . . .

Les quatre cocus . . .

On termine ainsi le dernier couplet:

Bien entendu,
On n'a plus d'autre cocu.

Cette ronde cumulative et trépidante ne semble pas connaître de règles fixes sur la façon d'être dansée tant les variantes d'exécution sont nombreuses. Dans quelques familles de Saint-Louis, les hommes seuls la dansaient. Les femmes rangées tout autour, chantaient et battaient des mains pour exciter les danseurs.

D'autres rondes, abandonnées par les adultes, ont été conservées par les fillettes qui les affectionnent et les dansent beaucoup plus fidèlement d'ailleurs que les garçons. Ces rondes tout comme les jeux dansés sont sensiblement les mêmes qu'on retrouve dans d'autres régions. Ainsi: *L'Avoine*, *La Boulangère*, *Ramenez vos moutons*, *Savez-vous planter les choux*, *Les Clés sont au fond de l'eau*, *Le Boiteux Ermite*, *La Sainte Vierge s'en va chantant*, *La Boiteuse*.

Cependant, il en existe deux qui, à l'Île-aux-Coudres, sont encore dansées par les adultes: *La Ronde des Oignons* et *La Danse du Rosier*. La première appartient à la catégorie des rondes à se retourner, assez populaires en France et en Belgique, mais qui semblent plutôt rares ici. Pour ma part, je n'en ai recueilli à travers mes enquêtes antérieures qu'une seule autre, *J'ai des pommes à vendre*, dansée par les fillettes. Elles se dansent comme une ronde ordinaire, excepté qu'à la fin de la chanson, les danseuses, en commençant par la plus âgée du groupe, sont tour à tour désignées par leur nom. Chacune fait demi-tour et continue le jeu,

le dos tourné vers l'intérieur du cercle. La danse se termine quand tout le monde s'est retourné. La chanson consiste en un seul refrain. Voici celui des *Oignons*:

Les oignons (*bis*) sont à bon marché,
Cinq ou six, sept ou huit, c'est pour un denier;
Sale-t-y, sale donc,
Mlle X . . . virez-vous l'croupion.

Le refrain des *Pommes à vendre* se termine de façon plus maligne:

Mlle X . . . dévirez-vous,
Cassez-vous l'cou,
C'est bon pour vous!

Comment expliquer cette finale, caractéristique des danses à se retourner? Serait-ce le vestige de pénitences qu'on distribuait anciennement aux survenants, aux danseurs trouble-fête ou aux indifférents, à ceux "qui n'aimaient pas", comme on en trouve dans les chansons de ballerie du moyen âge?

La *Danse du Rosier* est intéressante à plus d'un point de vue. Comme je l'ai dit plus haut, c'est la seule ronde, avec celle des *Oignons*, qui soit encore dansée par les adultes, et l'Île-aux-Coudres semble être le seul endroit qui les ait conservées comme danses. La chanson du rosier n'a que deux couplets et sa forme poétique primitive semble très ancienne:

Dans ma main droite, je tiens rosier (*bis*)
Qui fleurit, ma li lon la,
Qui porte fleur au mois de mai.

Entrez en danse, joli rosier (*bis*)
Faites le signe de la révérence.
Regardez comment-ce qu'on danse.
Embrassez, vous sortirez.

Les fillettes de l'Île dansent aussi cette ronde, mais bien différemment des adultes. Elles l'exécutent comme une ronde ouverte, ce qui la rapproche de la tresche, danse du haut moyen âge. Telle que dansée par les enfants, elle semble avoir gardé son ancien caractère religieux et incantatoire. Les fillettes vont l'une derrière l'autre, au pas de marche bien scandé, tête baissée, bras droit levé dans la position de quelqu'un qui tient un objet à la main. Rien de vif ni de sautillant, mais un air grave et recueilli. Les fillettes qui ont exécuté cette ronde devant moi m'ont dit que c'était "rien qu'à l'école qu'on la dansait comme ça, et qu'on l'avait toujours dansée comme ça". La transmission ne s'y fait que par les fillettes.

Passons maintenant aux danses d'adultes telles qu'elles se présentent, par exemple, au cours d'une soirée. A l'Île, les veillées de danse ont un caractère éminemment social: tous les "veilleux" sont des participants, soit qu'ils exécutent les danses eux-mêmes, soit, comme spectateurs, qu'ils incitent les danseurs à accélérer leur danse, par des cris, des apostrophes, des battements de mains ou qu'ils fassent chorus si la danse s'accompagne d'une chanson. Un vieil informateur qui fut pendant longtemps "pas battable" à la danse, me disait: "On commence toujours une veillée par le *Pont de Paris*". C'est une sorte de danse de file qui permet aux danseurs de "se mêler", de former des couples, et surtout de se "réchauffer", c'est-à-dire de s'exciter, d'établir en eux-mêmes un climat de danse. Le *Pont de Paris* est un curieux mélange de danse-promenade et de jeu à gages.

Puis alternent, selon un certain ordre, tantôt les danses exécutées par un ou deux hommes, comme les *Gigues*, le *Saute-Mouton*, la *Danse de la Jarretière*, sorte de "Sword Dance" écossaise (déjà décrite dans le deuxième volume des *Archives de Folklore*, 1946, p. 188); tantôt les danses mixtes à petits groupes ou bien les danses d'ensemble auxquelles participe une bonne partie de l'assemblée. Parmi les danses à petits groupes, il en est une dont les évolutions sont très gracieuses, c'est la *Danse du Mouchoir*, ainsi appelée du nom de l'accessoire qui permet la danse. Le jeu en est assez compliqué. Un meneur dirige les évolutions de deux danseuses en tirant, à la fois, un coin de l'un et l'autre des mouchoirs que chacune tient à sa main droite. Les danseuses, d'une vive allure, tracent des entrelacs autour du meneur qui, pendant ce temps, gigue, pivote sur lui-même et chante seul ce couplet à répétitions:

Mon compère, que diriez-vous
Si ma commère, dansait avec vous?
Je dirais oui, je dirais non,
La soupe au beurre faite à l'oignon.

On le chante aussi pour accompagner la danse de la jarretière, ou tout simplement comme une chanson, sans danse, à deux couplets. Pour être plus précis, disons que l'on répète tout simplement le premier couplet, en intervertissant l'ordre des personnages:

Ma commère, que diriez-vous
Si mon compère . . .

La chanson très rythmée soutient bien les danseurs. Vu la forme dialoguée du couplet et le sens des paroles qui nous fait croire à une invitation à la danse, on peut se demander si ce n'est pas là, encore une autre des manières anciennes de "rompre la glace" et de "partir une danse", comme on l'a vu précédemment avec le *Pont de Paris*.

Une autre danse à refrain, bien typique, dont on connaît des variantes dans plusieurs autres régions, c'est la *Barbe sauvage*. Elle appartient à la catégorie des danses de circonvolution; elle tient à la fois du travesti et du mime, n'exige que deux personnages, s'exécute aux pas de gigues et dans la note burlesque. On imaginerait aisément qu'elle se soit échappée d'une mascarade!

Comme dernière catégorie de chansons à danser, on trouve les danses d'endurance ou à compétition. Deux danseurs se font face et ne s'arrêtent de danser que lorsque l'un des deux cède à la fatigue. Citons, par exemple, *C'était un p'tit bonhomme*, gigue à croisements de jambes très compliqués, et le Cancan traditionnel qu'on trouve à l'origine du cancan des cabarets de Paris. A l'Île-aux-Coudres, cette dernière danse ne s'exécute que par des garçons qui se tiennent par les mains et sautent, en se balançant, tantôt sur une jambe, tantôt sur une autre. Dans l'une et l'autre danse, les exécutants chantent sans être soutenus d'aucune façon par l'assemblée.

Les autres danses que nous avons recueillies nécessitent l'accompagnement d'un instrument de musique. Ce sont des danses de groupe dont toutes, à l'exception du *Menuet*, appartiennent à la catégorie des danses "callées". Telles sont le *Rien neuf* (reel à 9), les *Petits Oiseaux* (reel à 3), la *Vireuse* (reel à 4), ainsi que l'*Oiseau dans la cage*, le *Pas d'avant*, le *Peleton*, *mesdames*, le *Salut*, les *Passes par six*. Les cinq dernières se présentent comme des figures isolées de cotillons anciens, telles qu'on en

trouve dans *le Traité de la Danse*, de M. Desrat (Paris). L'auteur y énumère cent quatre-vingt-trois figures de cotillons, connues aux environs de 1881. Ces figures se substituaient à volonté les unes aux autres, dans un cotillon, et chacune d'elles pouvait être une danse complète par elle-même.

Il y aurait une étude fort intéressante à faire un jour sur les "calls". Les "calleurs" de l'Île, en particulier, ont l'improvisation facile. Ils inventent autour des appels principaux toutes sortes de rimettes de nature à susciter chez les danseurs toujours plus de gaieté et d'entrain.

A l'Île-aux-Coudres, tout le monde danse à la manière moderne, comme on dit là-bas, même si la génération des plus âgés le désapprouve. Aujourd'hui, le danseur tient sa partenaire par la taille pour tourner, alors qu'autrefois les couples gardaient la distance réglementaire en se tenant par les bras. Malgré toutes ces précautions, la morale n'y trouvant pas son compte, l'Église dut renouveler ses interdictions. Mais les gens de l'Île, aiguillonnés par un besoin impérieux de danse, trouvèrent moyen, du moins pendant un certain temps, de satisfaire aux deux tendances opposées, sans pour cela encourir de condamnation: on habilla des hommes en femmes. Ce fut tout simple; il ne s'agissait que d'y penser. Le travesti donna l'illusion de véritables couples mixtes. "Naturellement, c'était pas aussi agréable, me raconta un vieil informateur, mais on pouvait, comme ça, continuer à danser. Les femmes, elles, dansaient pas."

Les instruments qui accompagnent la danse sont actuellement l'accordéon, la guitare, le violon et la "musique à bouche" (l'harmonica). "Les jeunes violonneux se font rares" m'a-t-on fait remarquer avec tristesse. On leur préfère la musique à bouche, moins fragile, et surtout moins encombrante que le violon. Cependant, il semble que ce qui menace sérieusement la survivance du violonneux, ce soit plutôt l'emploi de plus en plus fréquent de la musique sur disques dont on peut régler à volonté le volume et la vitesse. Le disque présente aussi cet avantage non moins précieux d'être prêt à toute heure, et invulnérable à la fatigue. Bien que la guitare soit aussi encombrante que le violon, le jeu en est plus facile et on l'introduit peu à peu dans les mœurs. C'est un élément de grande nouveauté que les jeunes insulaires apportent de "la grande ville" (Montréal).

Pour terminer, je puis dire que ma saison d'enquêtes à l'Île-aux-Coudres a été celle qui a enrichi le plus considérablement notre répertoire de danses anciennes. Pour la première fois, j'ai vu une population entière, et non quelques individus isolés, me donner spontanément et avec facilité les renseignements que je cherchais parce que, chez elle, la danse folklorique est chose d'actualité. Il n'y avait pas de ces efforts de mémoire auxquels il nous faut parfois assister chez les vieillards d'autres localités, peu nombreux, et qui ne se rappellent que par bribes le plus souvent les cotillons d'autrefois et spécialement les danses chantées qui sont les plus anciennes. Ma satisfaction ne vient pas seulement de l'abondance des matériaux recueillis, mais de cette constatation que l'enquête a pu se faire, avant qu'il ne soit trop tard, aux plus pures sources de notre passé local.

CRETACEOUS MAMMALS OF ALBERTA

By Loris S. Russell

INTRODUCTION

An examination of the mammalian fossils from the dinosaur fields of Alberta, preserved in the National Museum of Canada, has revealed the presence of several specimens not recorded in the literature. While placing these on record, it seems desirable also to review the entire mammalian fauna of these deposits. The present paper lists all such specimens in the National Museum of Canada, with such descriptions as are required, together with other specimens that are known to the writer. No doubt there are in other museums specimens that have not been recorded in publications, so that the present review may well be incomplete.

The earliest discovery of Cretaceous mammals in Alberta was made by Lawrence M. Lambe during his expeditions to the "Belly River" (Oldman) beds on Red Deer River. Lambe's descriptions (1902, pp. 79-81) suffered from the inadequate knowledge then available on the rich mammalian fauna of the Lance formation of Wyoming. This fauna, poorly described by O. C. Marsh, was ultimately given the treatment that it deserved by G. G. Simpson in a series of papers culminating in his "American Mesozoic Mammalia" (Simpson, 1929). Meanwhile, various collectors in search of dinosaur remains had discovered mammalian fossils in the badlands of Red Deer River. Amongst these collectors were C. H. Sternberg, W. E. Cutler, and Barnum Brown. The first fossil mammal from the Edmonton formation was discovered and recorded by C. M. Sternberg (1926, p. 104), who also made important finds in the Oldman formation near Steveville. Some specimens were also obtained in the latter area by L. Sternberg, for the Royal Ontario Museum. Mammalian remains were found in the Oldman formation of the Manyberries district by L. S. Russell (1940, p. 72) and C. M. Sternberg.

SYSTEMATIC DESCRIPTION

Order **Multituberculata**Family **Ptilodontidae***Cimolomys primaevus* (Lambe)

Plate XIV, figures 6 to 8

Ptilodus primaevus, Lambe, 1902, Geol. Surv. Canada, Contrib. Canad. Pal., vol. 3, pt. 2, p. 79, pl. 15, figs. 13, 14.

Cimolomys primaevus, Simpson, 1929, Peabody Mus. Yale Univ., Mem., vol. 3, pt. 1, p. 114.

Type. National Museum of Canada, No. 1890; incomplete left mandibular ramus with P₄ and M₁; Oldman formation, Belly River series, Upper Cretaceous; Red Deer River valley, near Steveville, Alberta; collected by L. M. Lambe, 1901.

Remarks. Lambe interpreted his type specimen as part of the right mandibular ramus, but present knowledge of ptiledont jaws indicates that it is from the left side, and the original description should be amended accordingly. No additional specimens referable to this species have come to light since Lambe's discovery. As pointed out by Simpson, the type specimen does not differ in any important way from small examples of *Cimolomys gracilis* Marsh, the characteristic ptiledont of the Lance fauna. However, I prefer to retain separate specific names for the Oldman mammals, in the confidence that additional specimens will show them to be distinct. On this basis, the name *Cimolomys primaevus* may be used for the smaller Oldman ptiledonts, in which there are relatively few cusps on the molars.

Cimolomys major Russell
Plate XIV, figures 1 to 5

Cimolomys major, Russell, 1936, Roy. Soc. Canada, Trans., ser. 3, vol. 30, sec. 4, p. 75, pl. 1, figs. 1-3.

Type. N.M.C. No. 8743; right mandibular ramus, with M_1 and M_2 ; Oldman formation, Belly River series, Upper Cretaceous; legal subdivision 10, section 29, township 21, range 12, W. 4th meridian, Red Deer River valley, near Steveville, Alberta; C. M. Sternberg, 1935.

Referred specimen. N.M.C. No. 8820; right P_4 ; Oldman formation; sec. 25, tp. 2, rge. 4, W. 4th merid., southeast of Manyberries, Alberta; L. S. Russell, 1936.

Remarks. The referred fourth lower premolar is considerably larger than that of *C. primaevus*, and seemingly would fit the type specimen of *C. major*, from which this tooth is missing. The premolar from Manyberries has eleven serrations. As pointed out in the original description of *C. major*, the size and the cusp formulæ in this species are just a little greater than the maximum for *C. gracilis*. The name *C. major* may therefore be used provisionally for the larger ptiledonts of the Oldman fauna.

Order Marsupialia

Family Didelphiidae

Eodelphis cutleri (A. S. Woodward)

Plate XV, figures 1 to 9

Cimolestes cutleri, Woodward, A. S., May 1916, Zool. Soc. London, Abst., No. 158; Sept. 1916, Zool. Soc. London, Proc., 1916, pp. 525-528, fig. 1.

Eodelphis browni, Matthew, July 1916, Amer. Mus. Nat. Hist., Bull., vol. 35, art. 25, pp. 482-491, figs. 1, 2, pls. 2-4.

Eodelphis cutleri, Simpson, 1928, Brit. Mus., Cat. Mes. Mamm., p. 148, pl. 12, figs. 1-3; 1929, Peabody Mus. Yale Univ., Mem., vol. 3, pt. 1, pp. 128, 129, figs. 48, 49; 1930, Nat. Mus. Canada, Bull. No. 63, pp. 29-32, pl. 7.

Type. Brit. Mus. (Nat. Hist.), No. M11532; right mandibular ramus with P_3 , M_2 , and M_3 ; Oldman formation, Belly River series, Upper Cretaceous, Red Deer River valley near Little Sandhill ("Sand") Creek, southeast of Steveville, Alberta; W. E. Cutler.

Referred specimens. (1) American Museum of Natural History No. 14169; left mandibular ramus with symphysis, all teeth represented, but some fragmentary, fragment of right zygomatic arch and temporal region (type of *E. browni* Matthew); Oldman formation; Red Deer River valley, on Little Sandhill ("Sand") Creek; Barnum Brown, 1915. (2) N.M.C. No. 8536 (*not* 8356, as given by Simpson, 1930), incomplete right mandibular ramus with four well-preserved molars; Oldman formation; ls. 10, sec. 29, tp. 21, rge. 12, W. 4th merid., Red Deer River valley, south of Steveville, Alberta; C. M. Sternberg, 1928. (3) Royal Ontario Museum of Palæontology No. 701; left mandibular ramus with P_3 to M_3 ; same formation and locality as preceding; L. Sternberg, 1934. (4) N.M.C. No. 8786, incomplete right mandibular ramus, with M_3 and M_4 ; Oldman formation; SW. $\frac{1}{4}$, sec. 35, tp. 4, rge. 5, W. 4th merid., about seven miles southeast of Manyberries, Alberta; C. M. Sternberg, 1937. (5) N.M.C. No. 8785, incomplete left mandibular ramus [not the other half of No. 8786]; same provenience as No. 8786. (6) N.M.C. No. 105; incomplete right mandibular ramus, with fragments of M_2 and M_4 , and worn M_3 ; Oldman formation; Red Deer River valley, 4 miles below mouth of Berry Creek, southeast of Steveville, Alberta; C. H. Sternberg, 1913. (7) N.M.C. No. 2168; badly worn lower right molar; Oldman formation; Red Deer River valley, on Onetree Creek, about 3 miles south of Steveville, Alberta; G. E. Lindblad, 1915. (8) N.M.C. No. 2221; incomplete right mandibular ramus, without teeth; Oldman formation; Red Deer River valley, 4 miles below mouth of Berry Creek, southeast of Steveville, Alberta; C. H. Sternberg, 1913.

Remarks. It is evident from the above list of specimens that this opossum is the commonest and most characteristic mammal in the Oldman formation ("Belly River stage"). It may be distinguished from all known didelphiids except *Diaphorodon* by the fact that the paraconid is approximately as high as the protoconid, and the metaconid is distinctly lower. The distinction between *Eodelphis* and *Diaphorodon* is not yet clear. Discovery of associated upper dentitions may help to settle this problem; upper teeth of *Eodelphis* are unknown, while the upper molars of *Diaphorodon* may be those known under the name *Didelphodon* but this cannot be proved. Of the specimens from the Red Deer River valley, all except N.M.C. No. 2221 are of about the same size and degree of robustness. The two rami from the Manyberries district (N.M.C. Nos. 8785 and 8786) are smaller and more slender than is typical, No. 8785 being more slender than No. 8786, and with the teeth unusually raised above the alveoli.

Diaphorodon? sp.

Plate XV, figure 10

Referred specimen. N.M.C. No. 8826; lower left molar, probably M_2 ; Edmonton formation, in upper or Lance portion; Red Deer River valley, sec. 35, tp. 33, rge. 22, W. 4th merid., west of Scollard, Alberta; C. M. Sternberg, 1925.

Remarks. The specimen is relatively robust, equalling in size the largest examples of the corresponding tooth in *Eodelphis cutleri*. Because of the worn condition of the trigonid, the relative development of the cusps

cannot be determined. It appears probable, however, that the protoconid was the highest, the paraconid nearly as high, and the metaconid distinctly lower. These features, together with the prominent anterior cingulum, are characteristic of the genus *Diaphorodon* Simpson. The specimen was submitted soon after its discovery to G. G. Simpson, who identified it cf. *Diaphorodon*.

Delphodon? praesagus, new species

Plate XIV, figures 9 to 11

Type. N.M.C. No. 114; incomplete right mandibular ramus, with M_3 , roots of M_4 , and posterior alveolus of M_2 ; Oldman formation, Belly River series, Upper Cretaceous; Red Deer River valley, 4 miles below mouth of Berry Creek, southeast of Steeveville, Alberta; C. H. Sternberg, 1913.

Specific characters. Of small but not extremely small size. Lower molars with high, distinct trigonid, which is relatively narrow from front to back and which has its long axis more transverse than oblique. Protoconid the highest cusp [broken in type], paraconid and metaconid subequal and set close together, hypoconid prominent. Anterior cingulum not much projecting, posterior cingulum distinct. Length of M_3 , 3.3 mm.; width, 2.2 mm.

Remarks. Simpson (1927) based the genus *Delphodon* on lower molars from the Lance formation in which the trigonid is low and the cusps subequal (*Didelphodon comptus* Marsh). Later (1929) he associated with this genus six other kinds of lower molars, under the designation Type 4, etc., distinguished from each other by relative elevation of the trigonid and size relationships of the cusps. In my opinion none of these, with the possible exception of Type 5, should be included in *Delphodon*. Meanwhile Russell (1928) had proposed to designate as *Delphodon? praenuntius* those lower molars in the Lance fauna in which the trigonid is high, the protoconid the highest cusp, and the paraconid and metaconid subequal and close together. It was recognized that these modern-looking molars probably represented a genus distinct from *Delphodon* as based on *D. comptus*, but it was not thought advisable to add another genus to the Lance fauna on the basis of isolated lower molars. Now the same type of tooth structure appears in the Oldman fauna, showing that it represents an important line of early didelphiid evolution, forecasting, but not giving rise to, the modern *Didelphis*.

It appears evident that the lower molars which have been designated *Delphodon? praenuntius* by me, Type 5 by Simpson, and *Delphodon? praesagus* here, represent a genus distinct from *Delphodon* or any other based on lower molars. However, I am most reluctant to add another form-genus to the Cretaceous mammalian fauna, especially when it is highly probable that the discovery of the associated upper dentitions would result in the relegation of such a genus to synonymy. Instead, I have followed the device adopted by me in 1928, distinguishing these teeth by means of specific names and referring these species with doubt to the genus *Delphodon*.

Boreodon matutinus Lambe
Plate XV, figure 11

Boreodon matutinus, Lambe, 1902, Geol. Surv. Canada, Contrib. Can. Pal., vol. 3, pt. 2, pp. 79, 80, pl. 15, fig. 15; Simpson, 1928, Peabody Mus. Yale Univ., Mem., vol. 3, pt. 1, p. 134.

Type. N.M.C. No. 1887, a premolar with one of its two roots broken off; Oldman formation; Red Deer River valley, near Steeveville, Alberta; L. M. Lambe, probably 1901.

Remarks. Although classed by Lambe as a multituberculate, this genus and species are didelphiid, as Simpson has indicated. It is very similar to the P_3 of *Didelphis virginiana*, but shows a distinctive posterior crest leading down to a small posterior cingular spur. The apex of the crown has been worn obliquely on the outer side. It seems probable that the type of *Boreodon matutinus* is the right P_3 of *Eodelphis cutleri*, but such a relationship cannot be proved. Therefore the genus and species may be regarded as indeterminate, and applicable only to the type specimen.

Stagodon sp.
Plate XV, figure 12

Referred specimen. N.M.C. No. 8868; a premolar, probably right P^3 ; Edmonton formation, in upper or Lance portion; Red Deer River valley, 8 miles northwest of Rumsey, Alberta; C. M. Sternberg, 1947.

Remarks. The form-genus *Stagodon* serves to distinguish Cretaceous didelphiid premolars, characterized by massive, bulbous crowns. They probably are the premolars of *Pedimys*, based on upper molars, and *Delphodon*, based on lower molars. The specimen recorded here is typical and is interesting as extending the geographical range, if not the geological. In 1929 I found a similar premolar in presumed Edmonton beds on Little Red Deer River within the foothills of western Alberta. This was recorded as "*Stagodon*" sp. (Russell, 1932, p. 143) and is preserved in the Department of Geology, University of Alberta.

Didelphiid, undeterminable

Remarks. An unidentifiable didelphiid is represented in the National Museum of Canada collection (No. 8869) by a fragment of the left mandibular ramus with the roots of three molars and the alveolus of another tooth in front. It is about the size of the corresponding part of *Eodelphis cutleri*, but more robust. Being from the Edmonton formation, it is worthy of special record. It was found in Red Deer River valley, 8 miles northwest of Rumsey, Alberta, by C. M. Sternberg, 1947.

LITERATURE CITED

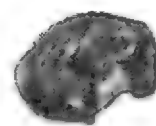
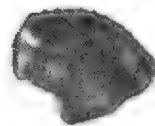
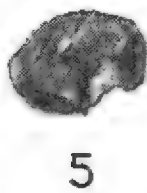
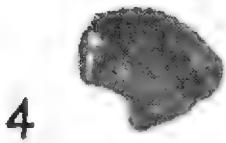
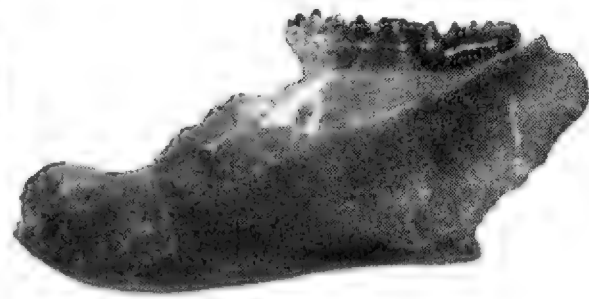
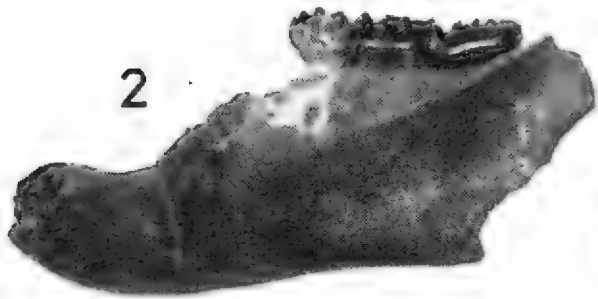
- Lambe, L. M. (1902): On Vertebrata of the Mid-Cretaceous of the North West Territory 2—New Genera and Species from the Belly River Series (Mid-Cretaceous). Geol. Surv., Canada, Contrib. Can. Pal., vol. 3, pt. 2, pp. 25-81, pls. 1-31.
Russell, L. S. (1928): Didelphiidae from the Lance Beds of Wyoming. Jour. Mammalogy, vol. 9, no. 3, pp. 229-232, figs. 1-4.

- — — (1932): The Cretaceous-Tertiary Transition of Alberta. Roy. Soc. Canada, Trans., ser. 3, vol. 26, sec. 4, pp. 121-156, 2 figs.
- — — (1940): Geology of the Southern Alberta Plains, Part I: Stratigraphy and Structure. Geol. Surv., Canada, Mem. 221, pp. 1-130, 21 figs., 3 maps.
- Simpson, G. G. (1927): Mesozoic Mammalia. VIII. Genera of Lance Mammals other than Multituberculates. Amer. Jour. Sci., vol. 14, pp. 121-130.
- — — (1929): American Mesozoic Mammalia. Peabody Mus. Yale Univ., Mem., vol. 3, pt. 1, 234 pp., 62 figs., 32 pls.
- Sternberg, C. M. (1926): Notes on the Edmonton Formation. Canad. Field-Nat., vol. 40, no. 5, pp. 102-104.

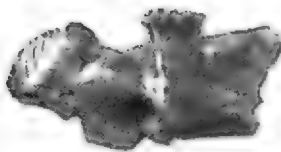
PLATE XIV

(All figures in stereoscopic pairs; $\times 2$)

- Figure 1. *Cimolomys major* Russell, holotype, N.M.C. No. 8742, internal view.
Figure 2. The same, external view.
Figure 3. The same, dorsal view.
Figure 4. *Cimolomys major* Russell, referred P₄, N.M.C. No. 8820, external view.
Figure 5. The same, internal view.
Figure 6. *Cimolomys primaevus* (Lambe), holotype, N.M.C. No. 1890, internal view.
Figure 7. The same, external view.
Figure 8. The same, dorsal view.
Figure 9. *Delphodon? praesagus* Russell, n. sp., holotype, N.M.C. No. 114, external view.
Figure 10. The same, internal view.
Figure 11. The same, dorsal view.



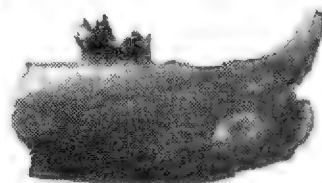
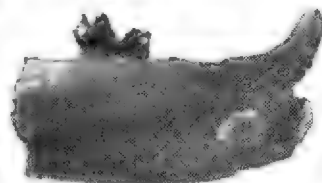
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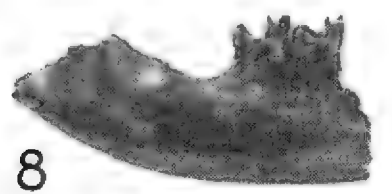
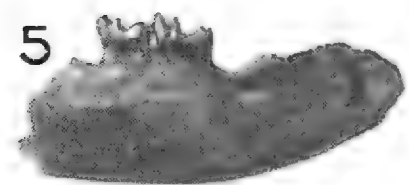
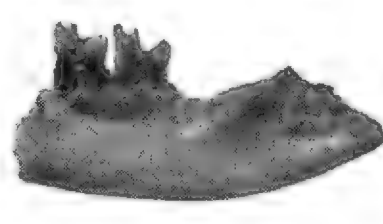
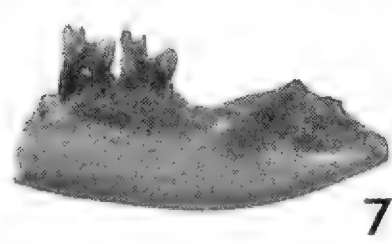
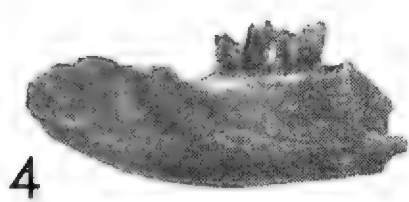
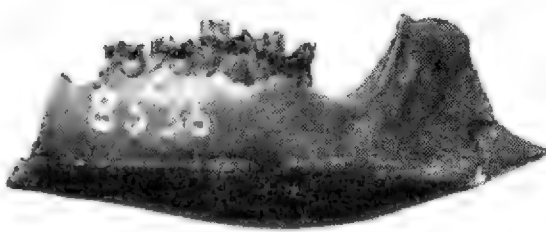
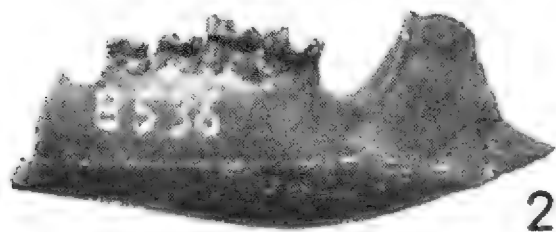
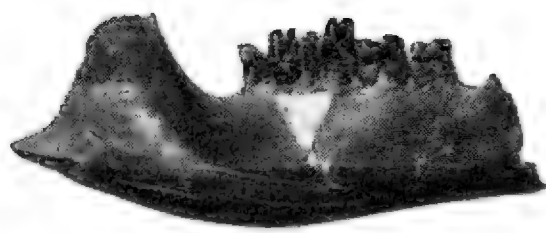
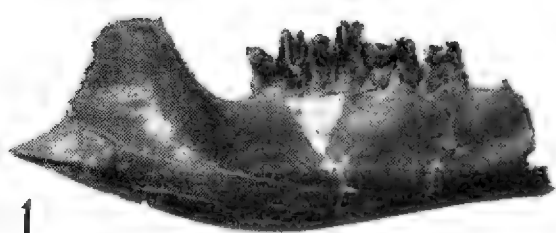
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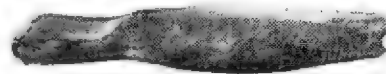
PLATE XV

(All figures in stereoscopic pairs)

- Figure 1. *Eodelphis cutleri* (Woodward), plesiotype, N.M.C. No. 8536, external view, $\times 1$.
- Figure 2. The same, internal view, $\times 1$.
- Figure 3. The same, dorsal view, $\times 1$.
- Figure 4. *Eodelphis cutleri* (Woodward), referred specimen, N.M.C. No. 8786, external view, $\times 1$.
- Figure 5. The same, internal view, $\times 1$.
- Figure 6. The same, dorsal view, $\times 1$.
- Figure 7. *Eodelphis cutleri* (Woodward), referred specimen, N.M.C. No. 8685, external view, $\times 1$.
- Figure 8. The same, internal view, $\times 1$.
- Figure 9. The same, dorsal view, $\times 1$.
- Figure 10. *Diaphorodon?* sp., lower molar, N.M.C. No. 8826, external view, $\times 2$.
- Figure 11. *Borcodon matutinus* Lambe, holotype, N.M.C. No. 1887, external view, $\times 2$.
- Figure 12. *Stagodon* sp., probable P³ (here orientated as a lower), N.M.C. No. 8868, external view.



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9

MOLLUSCAN FAUNA OF THE KISHENEHN FORMATION, SOUTHEASTERN BRITISH COLUMBIA

By Loris S. Russell

INTRODUCTION

The Cordilleran region of British Columbia has many valleys and basins occupied by Tertiary sediments, the precise age of which is unknown or uncertain. The easternmost of these occurrences is in the Flathead Valley, which is drained by the North Branch of Flathead River. This stream originates about six miles south of Corbin, B.C., and crosses the International Boundary into northwestern Montana at about longitude $114^{\circ} 30'$. At this point there is a Canadian Customs Office. The area is not accessible by motor vehicle from other parts of Canada but may be reached from West Glacier (Belton), Montana, by the Glacier Park road to Polebridge, where one crosses to the west side of the river and continues northward. Distance by this route is just 50 miles. Another approach is along the west side of the river from Columbia Falls, Montana, to Polebridge. The distance over this route is 58 miles, but the road is better, unless damaged by slides. North of the Boundary, roads suitable for motor vehicles extend only a few miles.

The mountain ranges east and west of Flathead Valley are made up of older rocks, ranging in age from Beltian to Cretaceous. The floor of the valley is extensively covered by drift and alluvium, and many likely-looking bends on the river are masked by slumps. Nevertheless there are a number of outcrops of soft sandstones and shales, which are less disturbed than the Cretaceous but obviously older than the drift. These were first observed by G. M. Dawson (1886, p. 52B), who described them as "hard pale clays and sandy clays," and noted their resemblance to the supposed Miocene of the plateau region. They were next mentioned by Willis (1902, p. 328) as "bluffs of clay, with interbedded sandstones and lignites," and were regarded by him as lake deposits of Miocene or Pliocene age. Daly, in his classic "Geology of the North American Cordillera" (1912, p. 86), gave a similar but more detailed description and applied the name Kishenehn formation from Kishenehn Creek, a tributary entering Flathead River from the northeast just south of the boundary. Daly was the first to collect fossils from these sediments, submitting them to Dr. T. W. Stanton of the U. S. Geological Survey. Dr. Stanton, as quoted by Daly, referred these to various genera of fresh-water molluscs and compared them with species in the Fort Union fauna of the northwestern plains. His suggestion of an Eocene age would read Paleocene in present terminology. The next author to discuss the Flathead Valley Tertiary was MacKenzie (1916, p. 31), who gave a detailed description with sections. MacKenzie mentioned two sedimentary facies, one consisting of coarse gravels and sands, and one of laminated limestone with fine clay and lignite. This author used the name "Kishinena" formation, following a later spelling of the name for the creek. MacKenzie collected

fossils from the limestone beds, and these were examined by W. H. Dall, of the U. S. National Museum, who recognized the general *Planorbis* and *Physa*. The shells referred to *Planorbis* were compared with two species: *P. utahensis* White [*sic.* actually Meek], and *P. cirratus* White, both from the Middle Eocene. MacKenzie, on the basis of Dall's and Stanton's findings, favoured an Eocene age for the "Kishinena" formation. Rose (1918, p. 31C) redescribed the "Kishinena" formation and mentioned that the beds show dips of 15 to 50 degrees.

In view of the diverse spellings of the formational name, I appealed to Dr. W. A. Bell, Director of the Geological Survey of Canada, for an official opinion on the correct name for the Flathead Valley Tertiary. Dr. Bell (personal communication) regards the original spelling of Daly, i.e., Kishenehn, as the only acceptable one, and points out that the creek was designated Kish-e-nehn on the maps of the First International Boundary Commission, 1857-61. MacKenzie's subsequent emendation to Kishinena is regarded by Dr. Bell as unjustified.

The importance of the Kishenehn formation is in its age, for it evidently was laid down after the Lewis overthrust but prior to a period of folding and gravity faulting. This was clearly pointed out by MacKenzie (1922, p. 105). A precise dating of the Kishenehn beds would not only establish the age of the major deformation in this part of the Rocky Mountains but would also throw light on subsequent events. (See also Billings, 1938, and Warren, 1938.)

RECENT WORK

In 1949, while I was on the staff of the Royal Ontario Museum of Palæontology, I received for examination a small collection of well-preserved molluscs from Flathead Valley, B.C. These were submitted by Professor P. S. Warren of the University of Alberta. The specimens had been collected by Mr. C. B. Newmarch, of Fernie, B.C., who had presented them to the Department of Geology, University of Alberta. The locality is at the junction of Couldrey and Burham Creeks (Locality W3 of this report), nearly three miles north of the International Boundary. Preliminary examination of this collection showed that determinable species were present, but the specimens were not quite good enough for an unquestionable identification. It seemed most desirable to make a full-scale palæontological expedition to the Flathead Valley.

Most of the month of July was spent in the Flathead Valley, following an examination of the Middle Eocene Bridger formation of Wyoming. Unfortunately, the two bridges over Flathead River were unusable, the upper one being washed out and the lower one being in process of rebuilding. Work was limited to outcrops that could be reached on foot from the vicinity of the Customs Office. Mr. Newmarch's locality was not reached. However, the first outcrop above the boundary, on the west side of the river (Locality W1) proved to be richly fossiliferous, and a large collection was obtained here, using methods borrowed from the technique of vertebrate palæontology. Several hundred pounds of rock and fossils were shipped to the National Museum, where the specimens

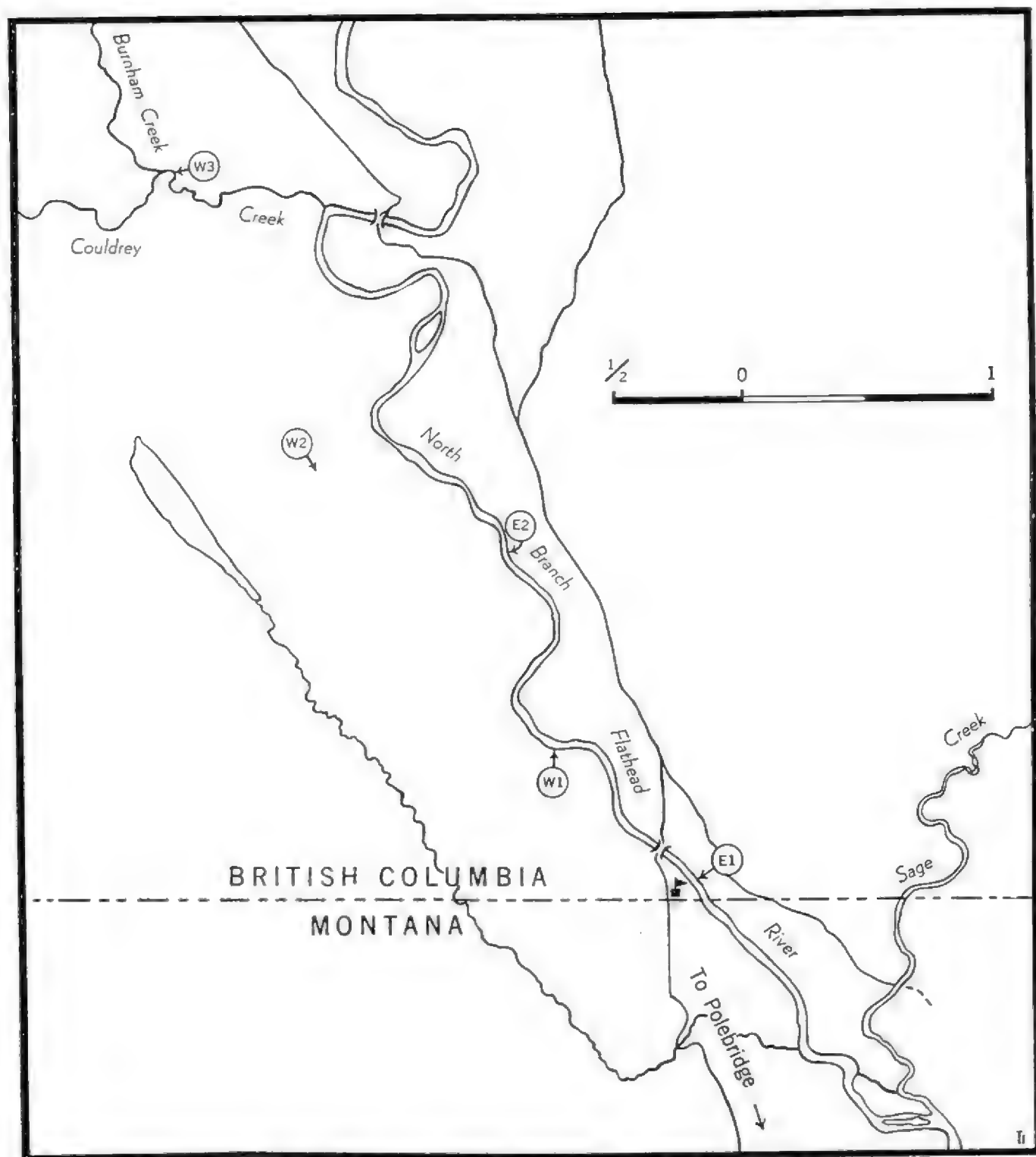


Figure 4. Sketch map of a part of Flathead Valley, southeastern British Columbia and adjacent Montana, showing location of fossil localities.

were freed, and the best-preserved prepared for study. Smaller lots of fossils were collected from the other outcrops reached by foot-traverse. It is hoped to revisit the area in 1951, at which time many more outcrops should be accessible.

I am indebted to Professor Warren for placing the Newmarch collection in my hands. To Mr. R. B. Stevenson, Canadian Customs officer at the Flathead Office, I am under obligation for much useful information on the area.

LOCALITIES

The accompanying outline map (Figure 4) of the southern part of Flathead Valley, B.C., is based on aerial photographs supplied by the Topographical Survey, Department of Mines and Technical Surveys. It shows the position of the fossil localities and other outcrops of Kishenehn beds examined by me. A system of designation is used that involves numbering each exposure from the International Boundary northward. Those on the east side of the river are numbered separately from those on the west, the two series being differentiated by the letters "E" and "W". Thus the first outcrop on the east side, north of the boundary, is designated E1; the first on the west side, W1; and so on. The following notes on these localities include geological observations.

Locality E1. This is a large cut-bank on the east side of the river between the first bridge and the International Boundary. A view of it from the vicinity of the bridge is shown in Plate XVI, figure 1. At the time of my visit, high water prevented complete examination, and although no fossils were obtained, these may be found by more extensive search. The following observations, made at the south end of the bank, are given here as a contribution to the description of Kishenehn sediments.

The exposure here displays a variegated series of sediments, predominantly brown and reddish, impure, friable shale, with some sandy beds. There are some conspicuous beds of impure nodular sandstone, mostly reddish in colour, which give the impression of being conglomerates. These beds alternate with more normal sandstone. Because the plane of exposure nearly coincides with the strike, the strata appear to dip slightly southeastward, but careful examination shows that the true dip is about 30 degrees to the east. At the north end of the bank, several streams of water emerge from the overlying drift.

Locality W1. This is a small outcrop on the west or right bank about 0.6 mile north of the Boundary (Plate XVI, figure 2). A rough but passable car trail goes to within 200 yards of it, and well-used game trails make it easily accessible from here on foot. Upstream from this outcrop there is a large slumped area, much frequented by deer, which are attracted by the slightly saline springs. From this locality I obtained my largest collection of fossil molluscs. Because of the easterly dip, a good thickness of strata is exposed. The following columnar section, measured here, gives the nature of the fossil-bearing beds and their relationship to adjacent strata.

Section of Kishenehn Beds at Locality W1

Concealed	Feet
Sandstone, soft, banded brown, grey-brown, and grey, with carbonaceous streaks.....	+4
Shale, grey, weathering rusty, flaky to friable, arenaceous in part.....	3.0
Sandstone, soft, grey-brown and grey.....	2.0
Shale, friable, brown.....	0.2
Sandstone, as above, but with irregular colour bands of rusty brown.....	4.3
Shale, variegated, in part sandy; friable, grey to grey-brown and pale grey, with rusty and purplish stains.....	19
Shale, carbonaceous, almost lignite, fissile in upper part, rectangular in cleavage below; very dark grey, rusty-weathering ..	1.0
Shale, friable, grey, fossiliferous (<i>Gyraulus procerus</i> , <i>Stagnicola newmarchi</i>).....	1.2
Shale, grey to grey-brown, rusty-weathering, becoming sandy and transitional below.....	4.5
Sandstone, moderately hard, somewhat shaly, tending to break into rectangular fragments; colour pale brownish grey, with rusty streaks.....	21.5
Shale, dark grey, somewhat fissile.....	0.4
Shale, sandy, hard, cleaving mostly into coarse fragments; colour light grey-brown, with purple and rusty stains.....	16.5
Sandstone, moderately hard, light grey-brown, base irregular....	0.6
Shale, friable, light grey and grey-brown, with rusty stains.....	3.5
Sandstone, moderately hard, clayey, light grey-brown, with brownish beds and thin black layers.....	25
Shale, sandy, tough, breaking into blocks; banded grey, dark grey, and grey-brown; scattered unionids and local accumulations of <i>Sphaerium progrediens</i>	5.7
Shale, similar to above, but softer, and with numerous rich layers of <i>Sphaerium progrediens</i> ; unionids at base.....	3.7
Tuff?, grey and rusty.....	0.1
Shale, dark grey-brown, friable, almost plastic when wet.....	+2
Concealed	

Along most of the bank at Locality W1, the strata show a regular dip of 30 degrees or more to the east. Near the upstream end there is a small drag fold, with overlap from east to west (i.e., up-dip). Beyond this fold the strata dip no more than 20 degrees, and the direction is more southeastward than eastward.

Locality E2. This is 1.4 miles due north of the boundary. It is a small cut-bank on the left bank just below a large bend. About 20 feet of strata are exposed, overlain by a gravel deposit. Near the middle of the bank there has been some slumping, permitting easy access to the bottom. The rock here is mostly impure friable shale, with some semi-plastic shale and some hard beds of impure, nodular sandstone. The colours range from brown to grey, reddish tones being noticeably absent. A fossil bed occurs near the middle of the outcrop, consisting of grey shale like that above and below, but with numerous small examples of *Stagnicola newmarchi* and some ostracods. At the time of my visit this bed was about six feet above the moderately high water level. Although the dip here was not measured, the strike of the strata could be observed on the hard beds in the river channel. This strike is a few degrees west of north, with the dip to the east side.

Locality W2. This exposure is situated on the hillside west of the river about one-quarter mile, and about $1\frac{3}{4}$ miles north of the Boundary. It consists of a large east-west trending cliff formed by a rock fall. The fallen material collapsed to the north, but at the same time slumped eastward, striating the face of the bed-rock. The most abundant rock here is a massive, grey-buff, clayey sandstone. Some yellowish impure limestone also occurs, with incomplete specimens of *Planorbis kishenehnensis*. The pronounced dip is eastward.

Locality W3. This is situated on the north bank of Couldrey ("Colder") Creek at the mouth of Burnham Creek. It is about 0.6 mile up Couldrey Creek from its junction with Flathead River, and about 2.9 miles due north of the Boundary. This is the site from which Mr. Newmarch collected the specimens which he presented to the University of Alberta. It was not visited by me, and its position on the accompanying map (Figure 4) is taken from the aerial photographs. The rock in which the fossils are preserved is a hard limestone, grey in colour but weathering pale buff. The preservation is good, but the hardness of the matrix makes it almost impossible to free any of the specimens completely. Both *Stagnicola newmarchi* and *Planorbis kishenehnensis* are abundant here; less common are crushed examples of *Gyraulus procerus*.

Study of the aerial photographs under a stereoscope shows that localities W2 and W3 are nearly in line along the strike. Prominent ridges can be observed south of Couldrey Creek which are obviously formed by differential erosion of the dipping Kishenehn strata. It is clear that, in spite of the local north-south strike observed along Flathead River, the regional strike of the Kishenehn formation is almost due northwest-southeast with a rather uniform dip to the northeast.

GENERAL CONCLUSIONS

The complete faunal list for the Kishenehn formation, made up from both the Newmarch collection and my own, is as follows:

Elliptio salissiensis, new species
Lampsilis dalyi, new species
Sphaerium progrediens, new species
Stagnicola newmarchi, new species
Planorbis kishenehnensis, new species
Gyraulus procerus, new species
Goniobasis sp.
 Ostracoda, undetermined
 Actinopterygia, undetermined

All the determined genera represent fresh-water molluscs, and most of them are characteristic of small lakes and ponds. The two unionid genera, however, are more suggestive of a stream environment. All of the species in the list are new. This makes the fauna an interesting addition to the known Tertiary molluscs but at the same time prevents it from being of much use for geological dating. The comparisons that can be made are little better than those of Dall (in MacKenzie, 1916, p. 36). *Stagnicola newmarchi* is very similar to *Stagnicola* ("Limnaea") *vetusta* Meek, but it is apparently distinct. *Planorbis kishenehnensis* has its closest

affinities in *Planorbis spectabilis* Meek but, as noted below, can be distinguished readily. Both of these comparisons are with species from the Bridger formation (Middle Eocene) of southwestern Wyoming. The differences are about what might be expected between contemporary species of such geographical separation. The poorly known species of *Goniobasis* also appears to resemble a Bridger species, *G. simpsoni* (Meek). On this rather tenuous basis the Kishenehn fauna may be referred to the Eocene epoch, with the Middle Eocene as the most likely precise dating. The disturbed attitude of the Kishenehn strata would itself suggest an Eocene age, as the evidence from the foothills and plains east of the Rocky Mountains indicates that the major orogeny was post-Paleocene and pre-Oligocene.

SYSTEMATIC DESCRIPTION

Phylum **Mollusca**

Family **Unionidae**

Elliptio salissiensis, new species
Text-figure 5; Plate XVII, figures 1, 2.

Type. Geological Survey of Canada No. 10101; both valves almost in natural contact, only slightly distorted and exfoliated.

Description. Shell of medium size, rather narrowly ovoid, shallow from side to side, not heavy. Beaks located about one-quarter of length from anterior end; not prominent. Anterior dorsal margin descending; anterior margin sharply rounded; ventral margin broadly convex; posterior margin narrowly rounded, slightly truncated at extremity; posterior dorsal

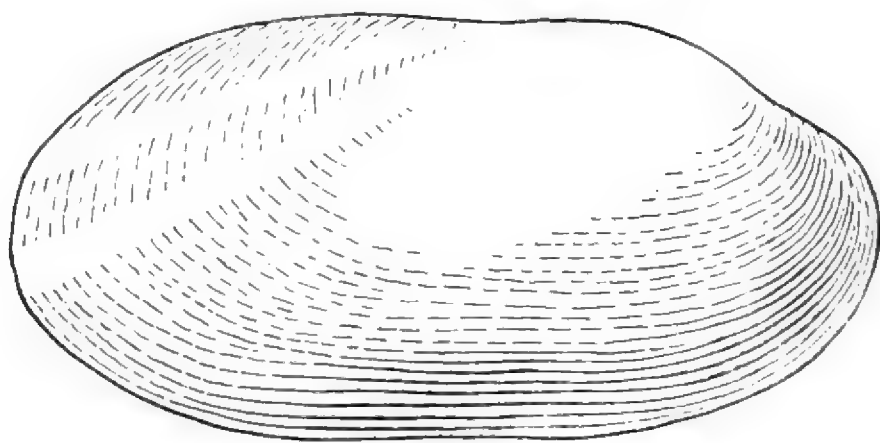


Figure 5. *Elliptio salissiensis*, restoration of right valve, external view, $\times 1$.

margin nearly straight in front, rounding to posterior margin behind. Two poorly defined post-umbonal ridges present. Surface marked by fine and rather uniform lines of growth; no umbonal ornamentation visible.

Measurements. Length of holotype, left valve, 67.5 mm.; right valve, 69.2 mm.; height, 36.3 mm.; thickness, as preserved, 21 mm.

Occurrence. Locality W1, Flathead Valley, British Columbia, rather common in lower part of section exposed here (see pp. 6, 7); Kishenehn formation, Eocene.

Remarks. Although shells of this species are abundant at the type locality, good examples are difficult to obtain because of the crushed and shattered condition of the shells. It has not been possible to prepare the dentition for description and illustration, but the narrowly ovoid, compressed form of the shell, together with the presence of post-umbonal ridges, strongly suggests the genus *Elliptio*. There is a superficial resemblance to *Elliptio priscus* (Meek and Hayden) from the Late Cretaceous and Paleocene, but in that species there is a distinct umbonal ornamentation of concentric ridges, and the post-umbonal markings are two fine, sharp lines. Some of the specimens of *E. salissiensis*, including the holotype, have the ligament preserved. The specific name has been coined by applying a Latinized name, *Salissia*, to the country of the Flathead or Salish Indians.

Lampsilis dalyi, new species
Text-figure 6; Plate XVII, figures 3 to 5

Type. G.S.C. No. 10102; a nearly complete shell, both valves in position, slightly crushed.

Description. Shell rather large, heavy, broadly ovoid, moderately convex. Beaks located about two-sevenths the length of shell from the anterior end; not much protruding. Anterior dorsal margin sloping; anterior margin well rounded; ventral margin broadly convex; posterior extremity sharply rounded but not produced; posterior dorsal margin

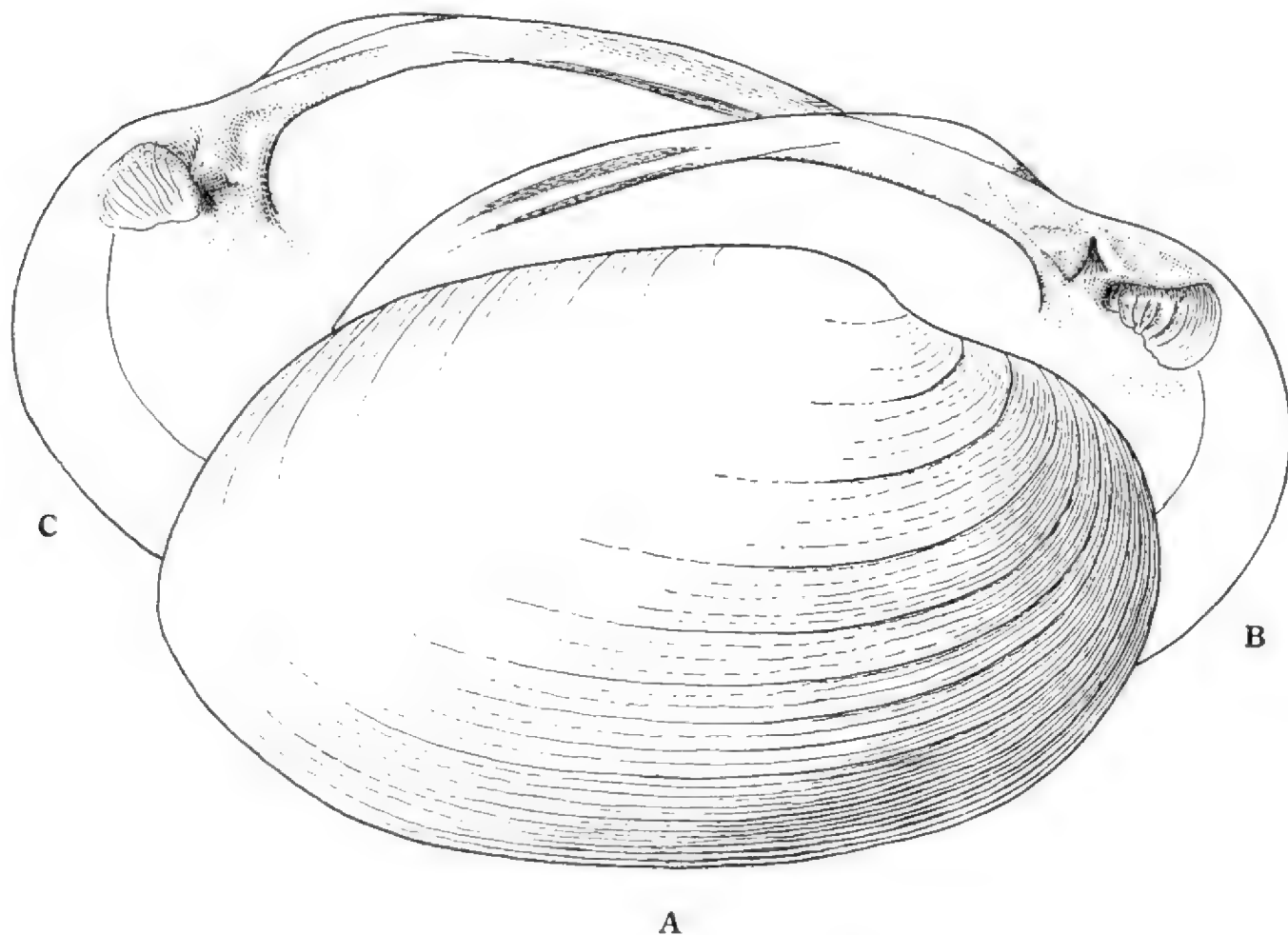


Figure 6. *Lampsilis dalyi*, restoration: A, right valve, external view; B, left valve, showing dentition; C, right valve, showing dentition; all $\times 1$.

nearly straight, curving into posterior margin. Surface apparently without distinct umbonal ornamentation; coarse, projecting growth wrinkles at intervals of about 5 mm., with faint growth lines between. Dentitions: right valve with single pseudocardinal tooth, massive and triangular, with hinge plate excavated in front and behind, supported by a broad buttress immediately behind the anterior adductor scar; single right lateral tooth; left valve with low pseudocardinal tooth above anterior adductor scar, followed by notch-like socket and by second, large, massive pseudocardinal merging into hinge plate behind; buttress beneath socket and second pseudocardinal; two left lateral teeth.

Measurements. Length of holotype, as preserved, 99.6 mm.; estimated original length, 105 mm.; height, as preserved, 65.4 mm.

Occurrence. Locality W1, Flathead Valley, B.C.; in lower part of section exposed here (pp. 6, 7) but not common; Kishenehn formation, Eocene.

Remarks. The reference of this species to the genus *Lampsilis* is suggested by the broadly ovate form, by the prominent growth wrinkles, and by the dentition, which is like a massive version of that in several living species. The heavy shell is not characteristic of modern *Lampsilis*. Among fossil species there is some resemblance to *Lampsilis sandersoni* (Warren) (1926), from the Upper Cretaceous of Alberta, but in this the posterior dorsal margin has a distinct slope.

Shells of this species, as of *Elliptio salissiensis*, retain well-preserved portions of the ligament.

The specific name is given in honour of Professor R. A. Daly, whose pioneer work (1912) along the 49th Parallel has been the basis for all subsequent geological work in the Flathead Valley area.

Family Sphaeriidae

Sphaerium progrediens, new species
Text-figure 7; Plate XVIII, figures 1 to 6

Type. G.S.C. No. 10104; imperfect, but both valves present, and the left showing dentition.

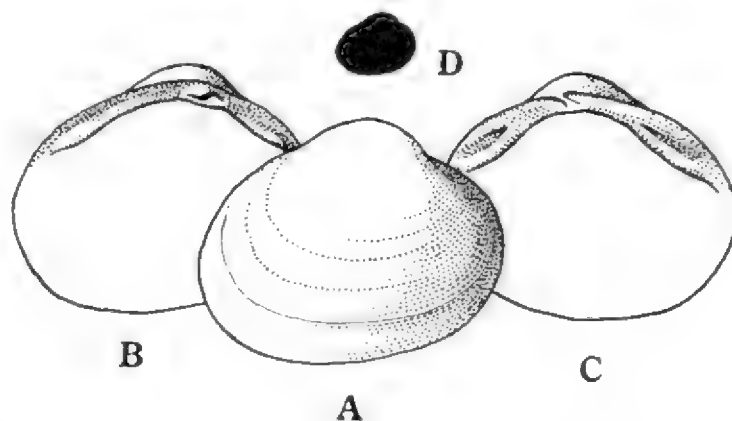


Figure 7. *Sphaerium progrediens*, restoration: A, right valve, external view, $\times 4$; B, left valve, showing dentition, $\times 4$; C, right valve, showing dentition, $\times 4$; D, silhouette, $\times 1$.

Description. Shell of moderate size for the genus, almost symmetrical in side view. Beak low in smaller shells, and placed near midlength; in larger shells more prominent, with a forward inclination. Dorsal margins short, sloping from beak; extremities broadly rounded except postero-ventral portion, which may be narrowly rounded in less symmetrical examples; ventral margin gently convex. Surface marked by fine, irregular growth lines and on some shells by a growth furrow. Dentition of right valve: one distinct, oblique cardinal tooth, and a toothlike ridge at base of hinge plate; anterior and posterior lateral socket, each with toothlike ridge above and below. Dentition of left valve: two oblique cardinal teeth, separated by a distinct socket, the lower or more anterior tooth having its apex curved upward and backward slightly to constrict opening of socket; one anterior and one posterior lateral tooth, each rising from ventral margin of hinge plate, and each bounded above by a broad longitudinal groove; anterior lateral tooth more prominent, almost pointed.

Measurements. Holotype: length of right valve, 6.5 mm. Paratype (large): length of right valve, 7.9 mm.; height, 6.8 mm.

Occurrence. Locality W1, Flathead Valley, B.C.; Kishenehn formation, Eocene; extremely abundant in lower part of section exposed here (see stratigraphical section, p. 124).

Remarks. In its dentition this species is strikingly modern, resembling closely such common living species as *S. simile* (Say). The hinge plate, however, is relatively broader and more massive than in modern species. *S. progrediens* is in striking contrast to certain species of *Sphaerium* in the late Cretaceous and Paleocene of western Canada; e.g., *S. fowleri* Russell, in which the dentition is *Cyrena*-like with as many as three cardinal teeth. *S. praecoquum* Russell, from the Oldman formation (Cretaceous), has the modern arrangement of the cardinals, but with the hinge plate excavated in front of these teeth, apparently an archaic characteristic.

Class Gastropoda

Family Lymnaeidae

Stagnicola newmarchi, new species

Text-figure 8; Plate XVIII, figures 7 to 11

Type. No. Eo. 198, Department of Geology, University of Alberta; apparently complete shell but exposed only on dorsal side.

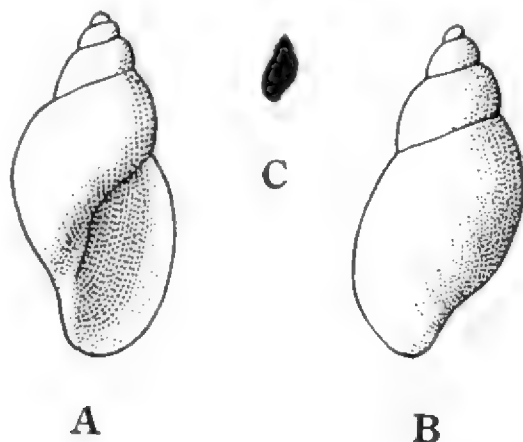


Figure 8. *Stagnicola newmarchi*, restoration: A, ventral view, $\times 4$; B, dorsal view, $\times 4$; silhouette, $\times 1$.

Description. Shell small, slender, with about four whorls, the earlier ones rounded, the body whorl rather elongate. Aperture narrowly ovoid, the length exceeding that of the spire; inner lip narrow but thickened, with a slight plication just in front of the parietal portion; umbilicus closed. Surface marked by fine, rather regular growth lines; colour white to pale bluish grey, but some specimens with a pink colouring, which marks the growth lines and also appears as fine revolving lines.

Measurements. Length of holotype, 6.2 mm.; length of a relatively large specimen, 11.0 mm.

Occurrence. Locality W3 (type) and Locality E2, Flathead Valley, British Columbia; Kishenehn formation, Eocene.

Remarks. This very modern-looking lymnaeid resembles the smaller varieties of the common *Stagnicola palustris* (Muller), some of which occur in the Pleistocene and Recent faunas of western Canada. Among fossil species it strongly suggests "*Limnaea*" *vetusta* Meek (1877, p. 191), from the Bridger formation (Middle Eocene) of southwestern Wyoming. Without comparing the Flathead Valley specimens with Meek's types, it appears that the new species differs in its smaller size, relatively shorter spire, and lesser development of the columellar plication. It is possible that larger specimens of *S. newmarchi*, if such exist, would resemble "*Limnaea*" *vetusta* even more closely. The supposed colour marking shown by some specimens (Plate XVIII, fig. 9), and described above, may be only mineral stains, but this is thought unlikely because the colouring follows the ornamentation and is found only in shells of this species and not in the associated planorbids.

The species is named for Mr. C. B. Newmarch, of Fernie, B.C., who collected the type specimens and presented them to the University of Alberta.

Family Planorbidae

Planorbis kishenehnensis, new species
Text-figure 9A; Plate XIX, figure 1

Type. No. Eo. 199, Department of Geology, University of Alberta; a nearly complete shell exposed on the right (umbilical) side.

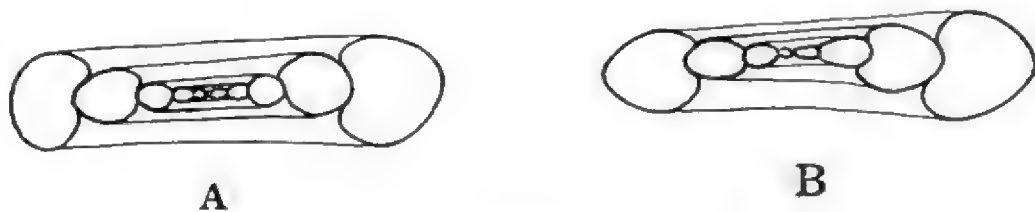


Figure 9. A, *Planorbis kishenehnensis*, transverse section; B, *Planorbis spectabilis*, transverse section; both $\times 1$.

Description. Shell discoidal, relatively large, with about five whorls, increasing regularly in size, not embracing previous whorl. Both sides of shell shallowly impressed, the inner whorls about equally on both sides, but the last whorl protruding more beyond the second-last on the left (apical), than on the right (umbilical) side. Inner whorls broadly oval in

cross-section; second-last whorl subearinate; last whorl well rounded externally, slightly impressed on inner side by periphery of second-last whorl. Shell wall thin; external surface marked by oblique growth lines.

Measurements. Maximum diameter of holotype, approximately 32 mm.

Occurrence. Holotype and numerous associated specimens from Locality W3; rare crushed specimens at Locality W1; Flathead Valley, British Columbia; Kishenehn formation, Eocene.

Remarks. Among fossil species the present one resembles *Planorbis spectabilis* Meek (1877, p. 189). This species and its variety *utahensis* Meek occur in the Bridger formation (Middle Eocene) of southwestern Wyoming. During the field season of 1950 I visited a field party of the Royal Ontario Museum of Palaeontology working in the Bridger formation, and while there collected specimens of *P. spectabilis*. Subsequently, additional specimens were obtained, and the whole collection has been lent to me for study by Dr. M. A. Fritz. One example, somewhat crushed but showing the surface ornamentation, appears in figure 2 of Plate XIX. From this species *P. kishenehnensis* may be distinguished by the absence of any angulation at the periphery and by the more rounded whorls, which are more numerous and increase less rapidly in diameter. It is interesting to note that Dall (quoted by MacKenzie, 1916, p. 36) compared specimens from the Kishenehn formation with *Planorbis utahensis*.

P. kishenehnensis does not represent the genus *Planorbis* in the restricted sense (See Baker, 1945, p. 52), as in that genus there are fewer whorls, and these increase in size more rapidly. There is some resemblance to species of the genus *Anisus* Studer, but in these, however, the shell is relatively small. Both *Planorbis* s.s. and *Anisus* are confined to the Eastern Hemisphere in the living fauna. The Flathead Valley specimens also resemble some species of *Drepanotrema* Fischer and Crosse, a tropical American genus, but these also have much smaller shells. From the form of the shell and from the geographical distribution of the species, it seems probable that *Planorbis spectabilis* and *P. kishenehnensis* represent a genus of Planorbidae not present in the living faunas. However, the distinctive features of the shell in these species are not pronounced, and in the absence of knowledge of the soft anatomy it is considered undesirable to erect a new genus.

Gyraulus procerus, new species
Text-figure 10; Plate XIX, figures 3 to 13

Type. G.S.C. No. 10109, a relatively large and nearly complete shell (original of Plate XIX, figs. 3-5).

Description. Shell of moderately large size for the genus, but unusually elevated, the apex of the spire projecting well above the top of the second-last whorl, and the body whorl well deflected. Volutions two and a half to three, rounded, slightly flattened on top. Aperture broadly ovoid, oblique. Umbilicus relatively narrow. Surface with obscure and irregular growth lines.

Measurements. Holotype: maximum diameter, 3.9 mm.; height 2.5 mm. Paratype (smallest): maximum diameter, 2.1 mm.

Occurrence. Localities W1 (type) and W3, Flathead Valley, British Columbia; Kishenehn formation, Eocene.

Remarks. The pronounced departure of these shells from the planispiral form usual in *Gyraulus* gives a very distinctive outline. The Recent *Gyraulus deflectus* (Say) includes examples that approach the present species in deflection of the body whorl, but even in these the spire remains

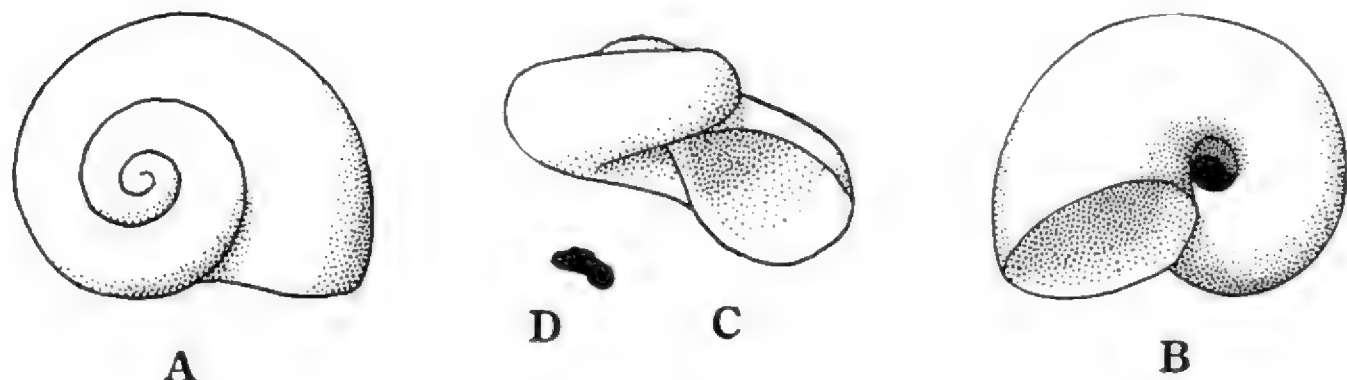


Figure 10. *Gyraulus procerus*, restoration: A, apical view, $\times 4$; B, basal view, $\times 4$; C, anterior view, $\times 4$; D, silhouette, $\times 1$.

flat on top. One might assume, if the Planorbidae were derived from gastropods with elevated spires, that the form of shell in *G. procerus* was a primitive condition. Living examples of *Gyraulus*, however, show by their soft anatomy and their posture that they are really sinistral, and that the dextral ("ultradextral") shell is formed, so to speak, by inverting the spire. If the Kishenehn specimens truly represent the genus *Gyraulus*, they are very specialized in shell form.

Among fossil species, the only closely comparable one is *Gyraulus militaris* White (1881, p. 159; 1883, pl. 28, figs. 10, 11), from the Paleocene or Lower Eocene of Utah. As far as can be determined from the description, *G. militaris* is more widely umbilicate, and with more pronounced growth lines, than *G. procerus*.

Family Pleuroceridae

Goniobasis sp.

Plate XIX, figures 14 to 16

Occurrence. Rare in the rich bed of *Sphaerium progrediens* at Locality W1.

Remarks. A few fragmentary shells of an elongate gastropod were recovered while preparing specimens of *Sphaerium progrediens*. These shells evidently represent a species of *Goniobasis*. They are characterized by well-rounded whorls, with growth lines and faint indications of low longitudinal costae (i.e., ridges transverse to the whorls). They could be immature or incomplete specimens of *Goniobasis simpsoni* (Meek), which occurs in the Middle Eocene of southwestern Wyoming. This comparison, while tentative, is interesting because of the resemblance of other species of the Kishenehn fauna to molluscs in the Bridger formation.

LITERATURE CITED

- Baker, F. C. (1945): The molluscan family Planorbidae. Univ. Illinois Press, xxxvi+530 pp., 141 pls.
- Billings, M. P. (1938): Physiographic relations of the Lewis overthrust in Northern Montana. *Amer. Jour. Sci.*, ser. 5, vol. 35, pp. 260-272, 6 figs.
- Daly, R. A. (1912): Geology of the North American Cordillera at the Forty-ninth Parallel. *Geol. Surv., Canada, Mem.* 38, pt. 1, 546 pp., 40 figs., 47 pls.
- Dawson, G. M. (1886): Preliminary report on the physical and geological features of that portion of the Rocky Mountains between Latitudes 49° and 51° 30'. *Geol. Surv., Canada, Ann. Rept.*, n.s., vol. 1, 1885, pp. 1B-169B, 10 figs., 2 pls., 2 maps.
- MacKenzie, J. D. (1916): Geology of a portion of the Flathead Coal area, British Columbia. *Geol. Surv., Canada, Mem.* 87, 53 pp., 1 fig., 1 pl., 1 map.
- (1922): The historical and structural geology of the southernmost Rocky Mountains of Canada. *Royal Soc., Canada, Trans.*, ser. 3, vol. 16, sec. 4, pp. 97-132, figs. 1-3.
- Meek, F. B. (1877): Palæontology. *U.S. Geol. Expl. 40th Par., Rept.* vol. 4, pt. 1, pp. 1-197, figs. 1-7, pls. 1-17.
- Rose, Bruce (1918): Crowsnest and Flathead coal areas, British Columbia. *Geol. Surv., Canada, Summ. Rept.*, 1917, pt. C, pp. 28c-35c.
- Warren, P. S. (1938): Age of the Selkirk and Rocky Mountain Uplifts in Canada. *Amer. Jour. Sci.*, ser. 5, vol. 36, pp. 66-71.
- White, C. A. (1881): Descriptions of New Invertebrate Fossils from the Mesozoic and Cenozoic Rocks of Arkansas, Wyoming, Colorado, and Utah. *U.S. National Museum, Proc.*, vol. 3, 1880, pp. 157-162.
- (1883): A Review of the Non-marine Fossil Mollusca of North America. *U.S. Geol. Surv.*, 3rd Ann. Rept., pp. 403-550, pls. 1-32.
- Willis, Bailey (1902): Stratigraphy and structure, Lewis and Livingston Ranges, Montana. *Geol. Soc. America, Bull.*, vol. 13, pp. 305-352, pls. 46-53.

PLATE XVI

1. Outcrop of Kishenehn beds at Locality E1, Flathead River just north of International Boundary.
2. Outcrop of Kishenehn beds at Locality W1, Flathead River 0.6 mile north of International Boundary; *Gyraulus* bed at dark band to left of centre, *Sphaerium* bed in background.



1



2

PLATE XVII

- Figure 1. *Elliptio salissiensis*, n.sp., holotype, Geological Survey of Canada No. 10101
left lateral view, $\times 1$.
Figure 2. Same, right lateral view, $\times 1$.
Figure 3. Same, dorsal view, $\times 1$.
Figure 4. *Lampsilis dalyi*, n.sp., holotype, G.S.C. No. 10102, right lateral view, $\times 1$.

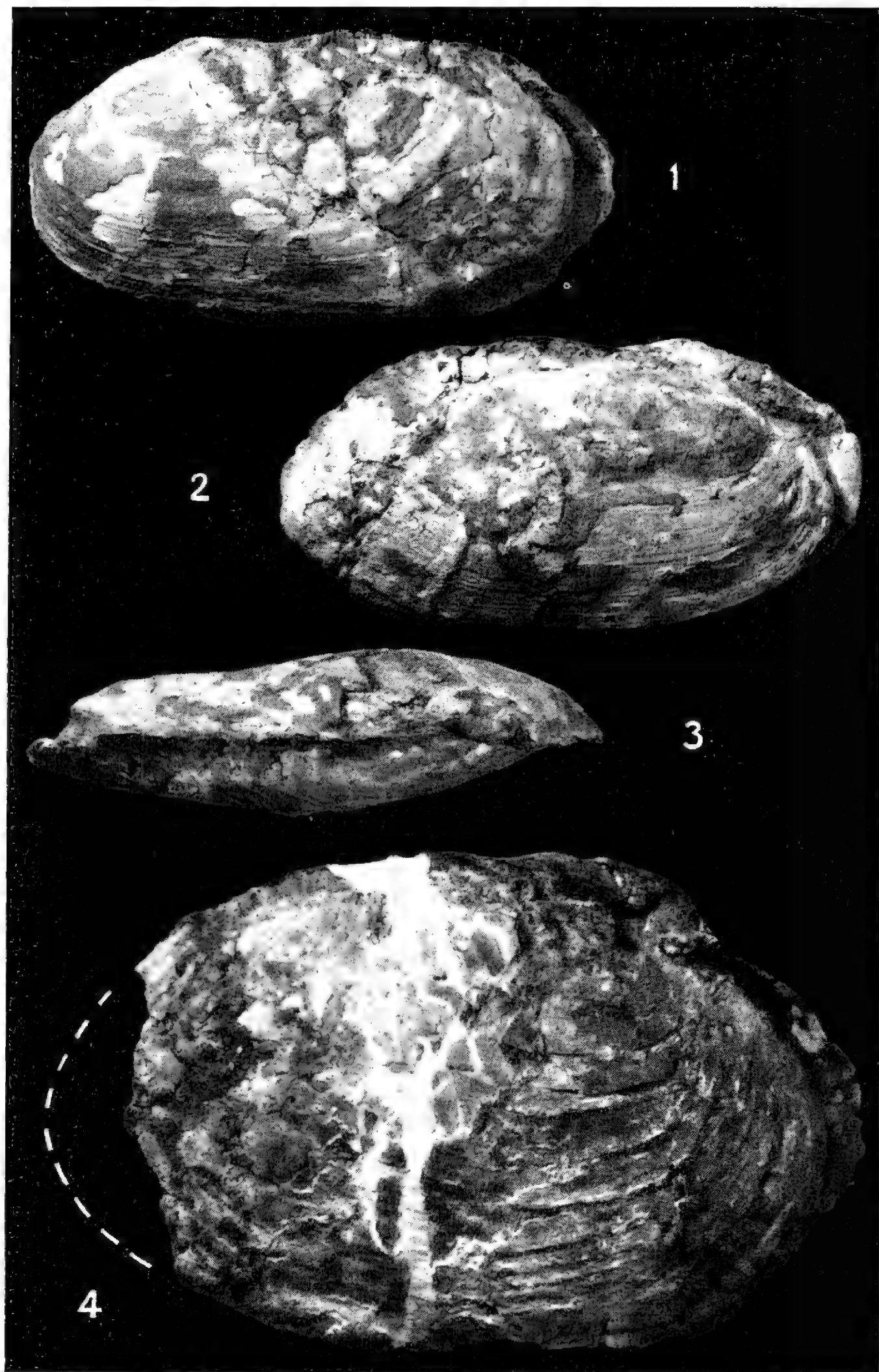


PLATE XVIII

- Figure 1. *Sphaerium progrediens*, n.sp., holotype, G.S.C. No. 10104, right lateral stereo views, $\times 4$.
- Figure 2. *S. progrediens*, n.sp., paratype, G.S.C. No. 10105, left valve, external stereo views, $\times 4$.
- Figure 3. *S. progrediens*, n.sp., paratype, G.S.C. No. 10106, right valve, internal stereo views, $\times 4$.
- Figure 4. *S. progrediens*, n.sp., paratype, G.S.C. No. 10107 (largest), right valve, external stereo views, $\times 4$.
- Figure 5. *S. progrediens*, n.sp., paratype, G.S.C. No. 10105, left valve, internal stereo views, $\times 4$.
- Figure 6. *S. progrediens*, n.sp., paratype, G.S.C. No. 10108, left valve, external stereo views, $\times 4$.
- Figure 7. *Stagnicola newmarchi*, n.sp., holotype, Dept. of Geology, University of Alberta, No. Eo. 198, dorsal stereo views, $\times 4$.
- Figure 8. *S. newmarchi*, n.sp., paratype, U. of A., ventral stereo views, $\times 4$.
- Figure 9. *S. newmarchi*, n.sp., paratype, U. of A., stereo views of specimen showing supposed colour markings, $\times 4$.
- Figure 10. *S. newmarchi*, n.sp., specimen from Locality E2, G.S.C., dorsal stereo views, $\times 4$.
- Figure 11. Same, ventral stereo views, $\times 4$.

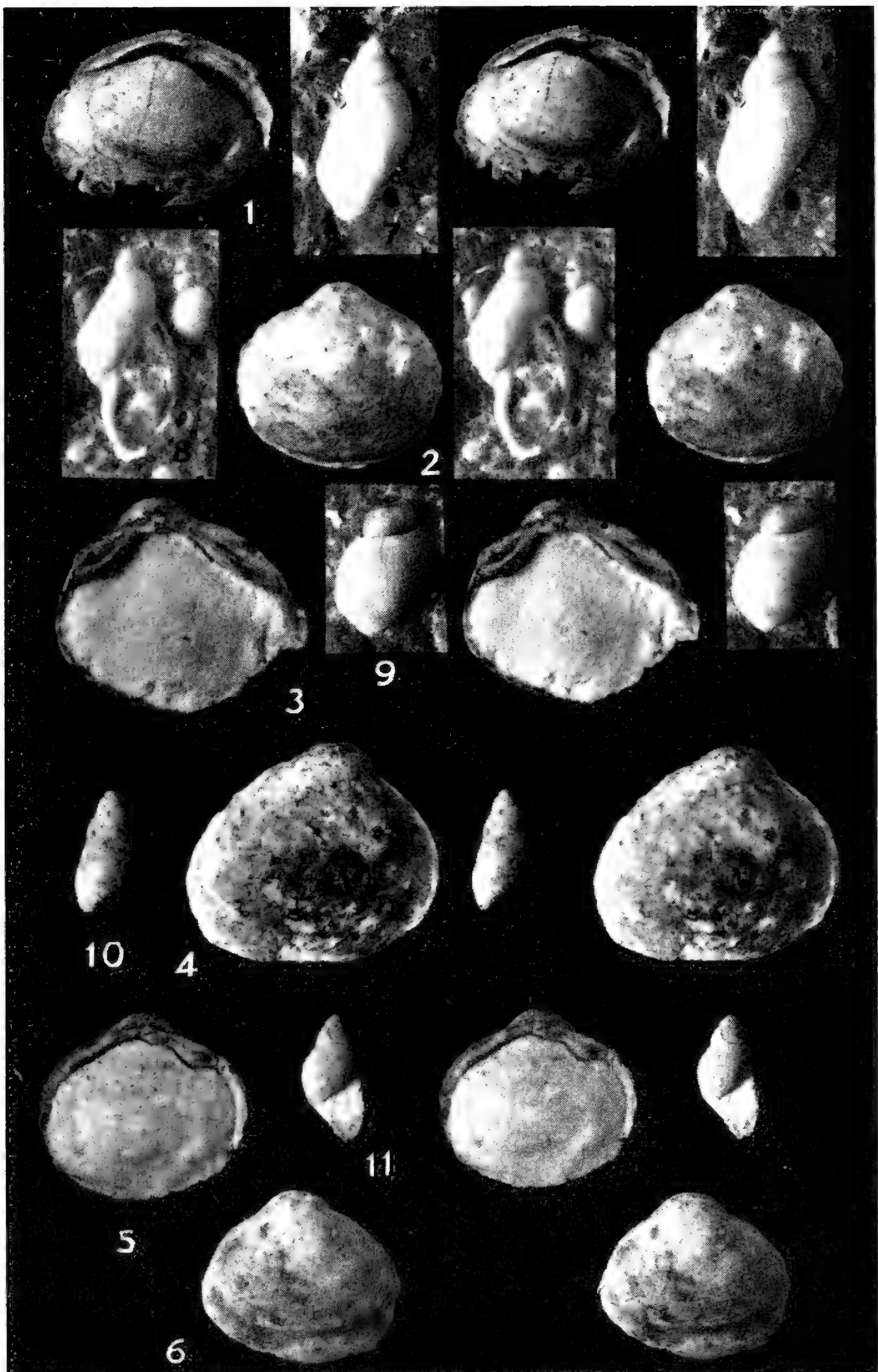
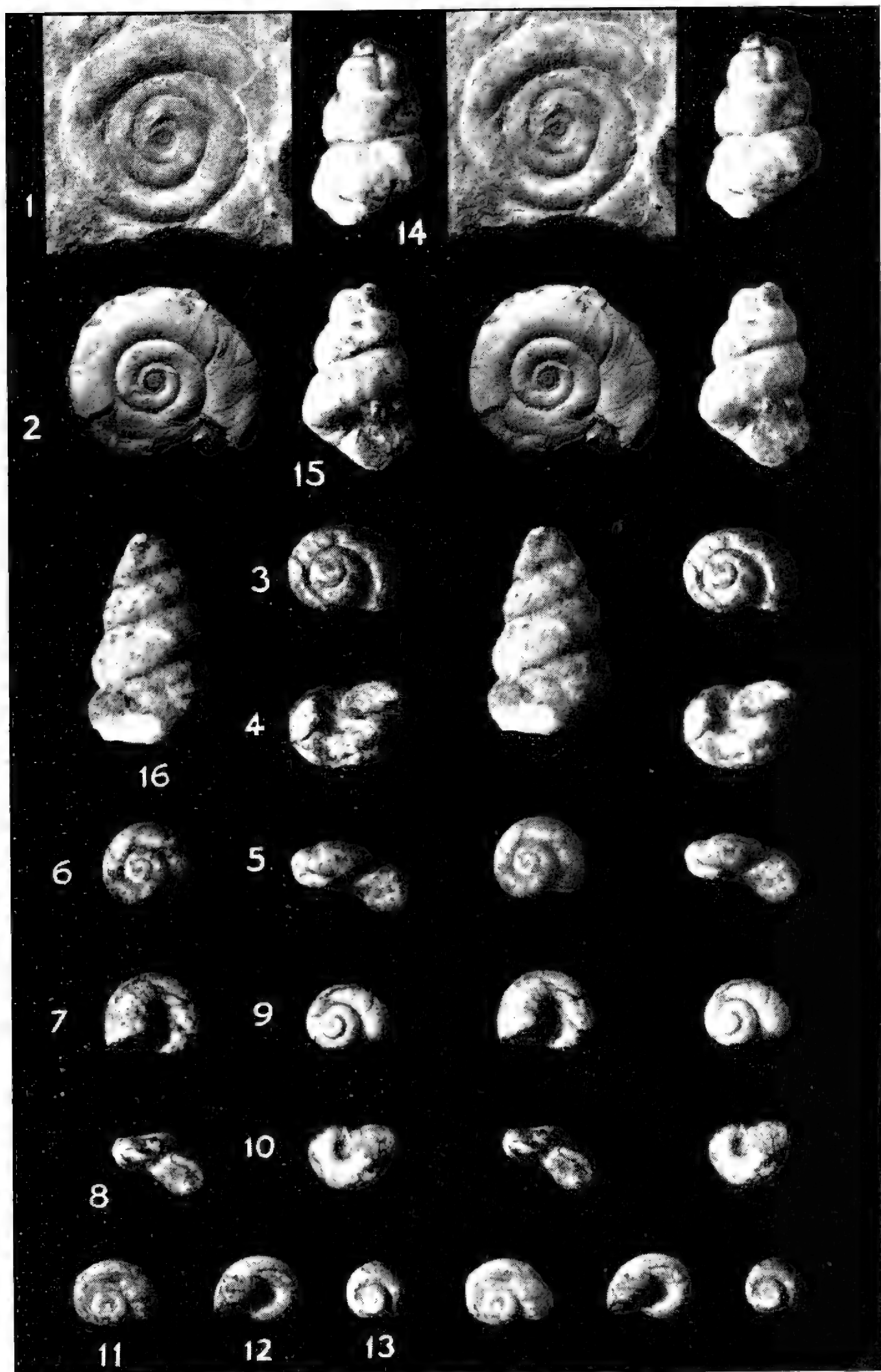


PLATE XIX

- Figure 1. *Planorbis kishenehnensis*, n.sp., holotype, Department of Geology, University of Alberta, No. Eo. 199, apical stereo views, $\times 1$.
- Figure 2. *Planorbis spectabilis* Meek, Bridger Eocene, Wyoming, specimen in Royal Ontario Museum, apical stereo views, $\times 1$.
- Figure 3. *Gyraulus procerus*, n.sp., holotype, G.S.C. No. 10109, apical stereo views, $\times 4$.
- Figure 4. Same, basal stereo views, $\times 4$.
- Figure 5. Same, anterior stereo views, $\times 4$.
- Figure 6. *G. procerus*, n.sp., paratype, G.S.C. No. 10110, apical stereo views, $\times 4$.
- Figure 7. Same, basal stereo views, $\times 4$.
- Figure 8. Same, anterior stereo views, $\times 4$.
- Figure 9. *G. procerus*, n.sp., paratype, G.S.C. No. 10111, apical stereo views, $\times 4$.
- Figure 10. Same, basal stereo views, $\times 4$.
- Figure 11. *G. procerus*, n.sp., paratype, G.S.C. No. 10112, apical stereo views, $\times 4$.
- Figure 12. Same, basal stereo views, $\times 4$.
- Figure 13. *G. procerus*, n.sp., paratype (smallest), G.S.C. No. 10113, apical stereo views, $\times 4$.
- Figure 14. *Goniobasis* sp., G.S.C. specimen, dorsal stereo views, $\times 4$.
- Figure 15. Same, ventral stereo views, $\times 4$.
- Figure 16. *Goniobasis* sp., another G.S.C. specimen, dorsal stereo views, $\times 4$.



BIRDS OF THE LESSER SLAVE LAKE - PEACE RIVER AREAS, ALBERTA

By W. Earl Godfrey

This report is based on the results obtained by a field party of the National Museum of Canada, which in the summer of 1950 investigated the birds of the Lesser Slave Lake and Peace River areas of Alberta. Emphasis was on the local distribution, numerical status, and species composition of the avifauna, and on the collecting and preparation of specimens. A collection of 479 bird specimens was made. In the field work the writer was efficiently assisted by Stuart D. MacDonald, Assistant Technician on the staff of the National Museum of Canada, and for brief periods by Ian V. F. Allen and Calvin D. Waterston.

Excellent descriptions of the topography and plant cover of the region by Raup (1934) and Soper (1949) obviate the need of repeating these here. A good earlier account of the general features of the region is that of Macoun (1904).

Base Camp 1 (June 2 to 26; August 6 to 8) of the National Museum 1950 field party was at Joussard on the south side of Lesser Slave Lake. From this base the birds of the country east to Kinuso, west to High Prairie, and north to Grouard were investigated. Some work also was done farther west between High Prairie and McLennan.

About Joussard, aspen (*Populus tremuloides*) and balsam poplar (*Populus balsamifera*) of good stature, variously mixed with white spruce (*Picea glauca*) make up an extensive forest in which agricultural clearings and broad natural openings are few. Tall shrubbery (of which willow and alder are most conspicuous) abounds about forest edge and margins of streams, lakes, and marshes. Bogs, wooded with black spruce (*Picea mariana*) and tamarack (*Larix laricina*) with undercover of *Sphagnum* and *Ledum* are not uncommon. Along the shores of Lesser Slave Lake, extensive marsh and marsh edge habitats are available. Farther west, between Enilda and High Prairie, the open flat farming country with its large grain and hay fields and patches of aspen, willow, and alder received attention also. Several streams meander sluggishly through the area, the largest of which are the East and West Prairie Rivers.

Base Camp 2 (June 27 to August 2) was near the south end of the Mackenzie Highway, 2 miles north of Grimshaw. From this camp the country along the Mackenzie Highway north to Meikle River was studied intensively, and some work was done farther north between Meikle River and Keg River. Investigations were made also in the area east to Peace River Village, south to Shaftsbury and Dunvegan in the Peace River valley, and west to Hines Creek.

The various types of habitat between Grimshaw and Keg River were made easily available by the Mackenzie Highway: aspen, mixedwood, and coniferous forest; tall and short shrubbery; prairie meadow and cultivated field; buildings of man; bog and marsh; lake and pond; river and stream. Travelling northward between Grimshaw and Dixonville, one passes through much flat or gently rolling farmed country with its

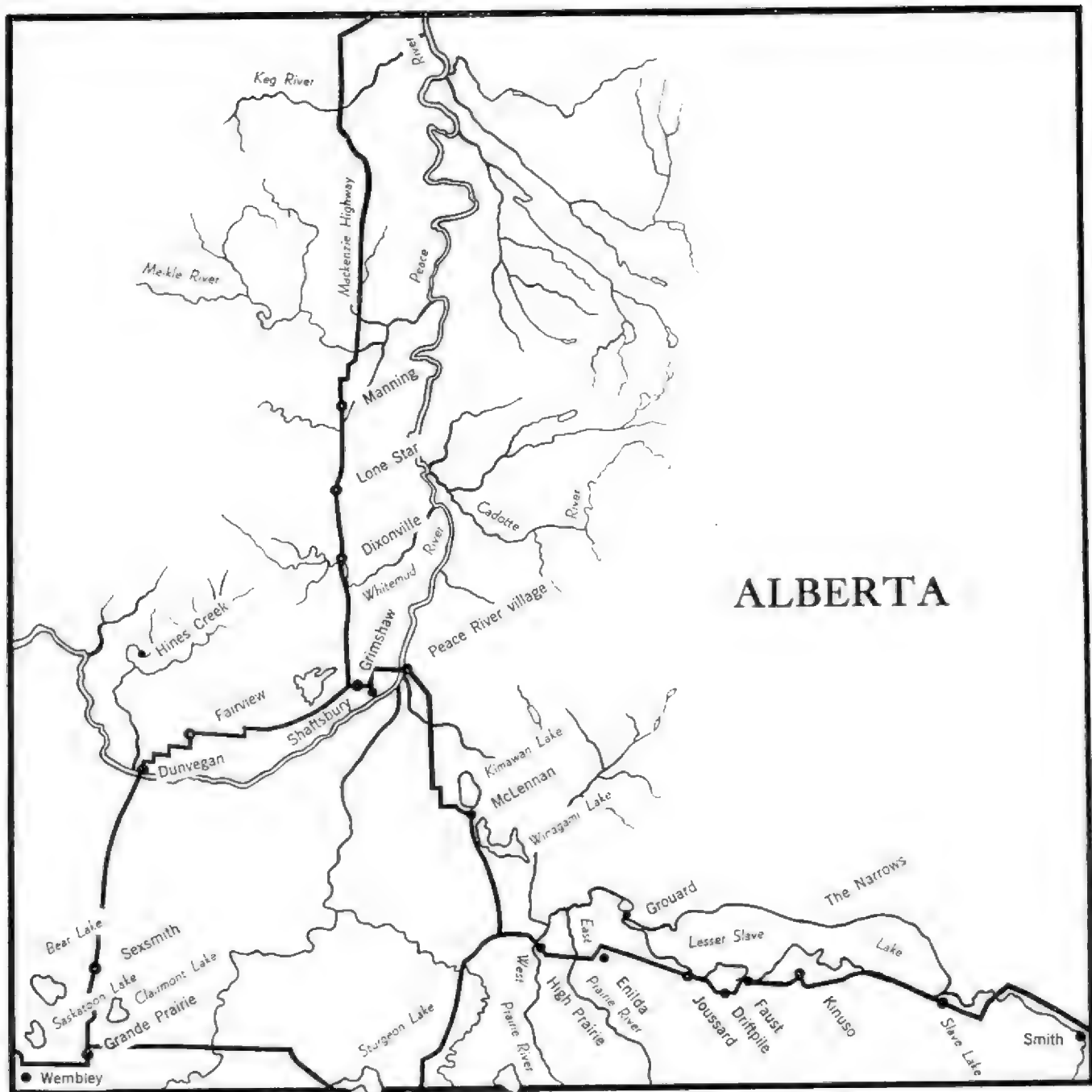


Figure 11. Map of the Lesser Slave Lake–Peace River Areas, Alta.

extensive clearings, buildings, and broad grain fields. Farther north, however, between Dixonville and Lone Star, the woodland is almost unbroken by agriculture. Near Lone Star the road descends abruptly to a level plain on which fields of wheat, oats, barley, flax, and other cultivated crops, interspersed with relatively small patches of aspen and willow, extend north to near the vicinity of Meikle River. Beyond this, between Meikle River and Keg River, the highway traverses flat to rolling woodland and passes over the eastern end of the low, round-topped Hawk Hills. Aspen covers large areas of this country, and there is considerable balsam poplar and white birch *Betula papyrifera*, these more or less associated in varying proportions with conifers. In places good stands of unmixed forest of, respectively, spruce and pine are present.

The warm, sheltered habitats of the Peace River valley, particularly at Shaftsbury, received considerable attention. Also of especial interest are the bluffs along the Peace River valley. On the most arid of these, which are south-facing, well-drained, and dried by exposure to wind and sun, tree growth is mainly aspen and is confined mostly to the coulées. There are extensive treeless grassy areas on which the cactus *Opuntia polyacantha* is not uncommon and which are one of the few habitats locally favoured by the Western Meadowlark *Sturnella neglecta neglecta*.

One of the features of the Grimshaw area from an ornithological viewpoint is Cardinal Lake, a relatively shallow body of water perhaps 7 miles long. Its water, marshes, and mud flats are especially attractive to grebes, waterfowl, gulls, terns, rails, red-winged blackbirds, and shore birds.

On August 3 and 4 the Grande Prairie area was visited, and observations were made at Clairmont, Bear, and Saskatoon Lakes. On August 5 several hours were spent at Sturgeon Lake en route to Jossard.

PREVIOUS WORK

Baird, Brewer, and Ridgway (1874) and Preble (1908) make occasional reference to specimens collected at Lesser Slave Lake in 1868 by Strachan Jones for the United States National Museum. James M. Macoun (1904) and William Spreadborough made observations in the region and collected specimens now in the National Museum of Canada during the summer of 1903; many of these data were published by Macoun and Macoun (1909). Farley (1917) made notes on birds he observed near Grande Prairie from June 30 to July 3, 1916. Williams (1922 and 1933) travelled down Peace River in 1921 and up that river in 1922. Although most of his observations were made in areas outside the one here considered, he began both these expeditions at Peace River Village and made some observations within our area. In 1930 Dr. C. H. D. Clarke (MS.) spent the period September 10 to 30 at Lesser Slave Lake and kindly made an abstract of his observations available. Eaton (1948) studied birds during a canoe trip, June 15 to July 1, 1940, from Peace River Village down Peace River to Slave River. Soper (1949) spent the period May 23 to early September, 1944, in the Peace River-Grande Prairie region. His detailed annotated list of 162 species is by far the best account of the birds of the region, and since his itinerary differed considerably from ours in 1950, it should be read in connection with the present paper.

Accounts of the birds of other nearby regions are that of Cowan (1939) on the Peace River area of British Columbia; Rand (1944) on the southern part of the Alaska Highway; Randall (1933) on the Athabasca District of Alberta; Baker and Walkinshaw (1946) on the Fawcett area, Alberta; and Soper (1942) on the Wood Buffalo Park region, northeastern Alberta and southern Mackenzie.

SYSTEMATIC LIST

It will be understood that in the following list, all data for which no authority is given were obtained in 1950 by the National Museum's 1950 Alberta expedition. A number in parentheses following a date is the number of bird individuals observed on that date.

Common Loon. *Gavia immer* (Brünnich)

Relatively rare. On Lesser Slave Lake two were noted near Joussard on June 3, and two adults and one young near Wagner, August 8. One was seen at Cardinal Lake, July 15; one near Mile 90, Mackenzie Highway, July 24; and thirteen at Baptiste Lake on August 8.

Holboell Grebe. *Colymbus grisegena holböllii* (Reinhardt)

Observed in small numbers about *Scirpus* borders of Lesser Slave Lake at Joussard, Kinuso, and Grouard, June 8 to 24, later at Cardinal, Baptiste, and Mitsue Lakes.

Horned Grebe. *Colymbus auritus* Linnaeus

Uncommon; breeds. On small sloughs and sluggish streams we observed this grebe as follows: Grouard, June 9(1); Kinuso, June 10(3); High Prairie, June 23(1); Flood Lake, July 13 (1 adult, 2 young); Hines Creek, July 18 (2 adults, 4 young); Cardinal Lake, July 25(1).

Eared Grebe. *Colymbus caspicus californicus* (Heermann)

Common to abundant breeder about many of the lakes; especially in the Grande Prairie region.

Western Grebe. *Aechmophorus occidentalis* (Lawrence)

Observed in small numbers along the shores of Lesser Slave Lake at "The Narrows," Faust, Joussard, and Grouard; and at Cardinal Lake. Most numerous at "The Narrows" where thirty-one were counted on June 10.

White Pelican. *Pelecanus erythrorhynchos* Gmelin

Observed on Lesser Slave Lake as follows: June 2(3), 3(4), 5(4), 6(5), 7(1), 8(14), 9(8), 10(33), 13(3), 14(1), 15(2), 16(53), 17(5, Big Buffalo Bay), 18(23), 19(9), 21(1), 22(12), 24(9), 25(6), 26(9). On August 6, ninety-two were counted at "The Narrows" north of Kinuso.

Double-crested Cormorant. *Phalacrocorax auritus auritus* (Lesson)

At "The Narrows" of Lesser Slave Lake, north of Kinuso, MacDonald and the writer counted twenty-six on August 6. These were in flocks of twenty-two, two, one, and one. This species was not recorded by Soper (1949), and we did not observe it elsewhere.

Great Blue Heron. *Ardea herodias* subsp.

Soper (1949) did not personally observe this species, but he was told that a small colony formerly nested on Dog Island, eastern end of Lesser Slave Lake. We observed a solitary adult near Joussard on the shore of Lesser Slave Lake in the evening of June 23.

American Bittern. *Botaurus lentiginosus* (Montagu)

Although Soper (1949) noted this species only once, we found it locally not uncommon, occurring in marshy edges of lakes, sloughs, and sluggish streams. We noted it on the shores of Lesser Slave Lake (near Joussard, Grouard, and "The Narrows") on June 8(1), 14(3), 17(1), 19(1), 21(2), 23(1); 11 to 14 miles north of Grimshaw, June 30(1), July 15(1); at Cardinal Lake, July 12(1); and at Clairmont Lake, August 5(1).

Specimen:

Joussard: 1 ad. ♂; June 14, 1950

Whistling Swan. *Cygnus columbianus* (Ord.)

Reports given the writer of migrating swans at Cardinal Lake, Enilda, and Driftpile almost certainly apply to this species. Soper (1949) also had similar reports concerning this species.

Trumpeter Swan. *Cygnus buccinator* Richardson

On August 3 and 4 we observed six adults at Clairmont and Saskatoon Lakes. One pair was accompanied by five young, another pair by two young, and one pair apparently had no young. On August 4, another pair of adults was accompanied by five young. Soper (1949) outlines the extent of the breeding range in this part of Alberta. Its breeding was first recorded from the region by Lloyd (1922).

There are two specimens in the National Museum of Canada, both of which died of natural causes:

Clairmont: 1 ♂; January, 1921. L. E. Bodie (see Lloyd, 1922)

Wembley (Cutbank Lake): 1 ♂; June 16, 1950. Bernard Hamm and David A. Munro

Athabaska Canada Goose. *Branta canadensis parvipes* (Cassin)

Thirteen in flight near Joussard on June 8 and a single adult flushed at Cardinal Lake were our only observations. Presumably it was more numerous at Cardinal Lake in 1944 when Soper (1949) saw it daily between August 4 and 8. Trevor Lloyd said that it is common in spring and autumn migration. On August 8, 1932, Dr. L. S. Russell (oral) saw eight on Cadotte River about 5 miles above its mouth.

Specimen:

Peace River Crossing (100 miles north): 1 ad. ♀; May 19, 1921, M. Y. Williams

This specimen tends in size decidedly toward *moffitti*.

Lesser Snow Goose. *Chen hyperborea hyperborea* (Pallas)

Less common migrant than the preceding species according to Trevor Lloyd (oral). C. H. D. Clarke (MS.) noted a flock near Slave Lake between September 10 and 30, 1930.

Common Mallard. *Anas platyrhynchos platyrhynchos* Linnaeus

Probably the commonest duck of the region, occurring on almost all the marshes, lakes, sloughs, ponds, and sluggish streams. Several nests

and numerous broods of young were noted. A male mallard bearing band No. 507-52455 was taken by an Indian near Driftpile in spring 1950. This had been banded on South Platte River, Sedgwick, Colorado, on January 30, 1950.

Gadwall. *Anas strepera* Linnaeus

Soper (1949) noted this species at fourteen lakes in the Grande Prairie district and at one near Hythe. In 1950, we noted it in the following additional localities: Joussard, June 8(6); Grouard, June 9(4); Kimawan and Winagami Lakes, June 12(8); Cardinal Lake, July 2(4), 3(2), 7(2), 11(2), 12(1), 16(2), 12(1). Preble (1908) said that eggs were collected at Lesser Slave Lake, probably in 1868, by Strachan Jones. Clarke (MS.) commented "not many" in the marshes of Lesser Slave Lake in September, 1930.

American Pintail. *Anas acuta tzitzihua* Vieillot

Soper (1949) found this one of the scarcer ducks and placed it twelfth in duck species relative abundance. In the area we studied in 1950, however, this was one of the commonest ducks in the Lesser Slave Lake marshes, and at Kimawan, Winagami, Cardinal, and Flood Lakes. Nests and many broods of young were noted. Clarke (MS.) recorded it as common in the Lesser Slave marshes, September 10 to 30, 1930.

Green-winged Teal. *Anas carolinensis* Gmelin

Noted regularly but in small numbers on the Lesser Slave Lake marshes, and at Flood and Cardinal Lakes, with broods of young at the last-mentioned two localities.

Blue-winged Teal. *Anas discors* Linnaeus

Our observations agree with those of Soper (1949) that this species is of more uniform distribution and is about twice as numerous as the preceding species. Nests near Joussard, in the Lesser Slave Lake marshes, were found on June 8 (nine eggs) and on June 9 (ten eggs).

Baldpate. *Mareca americana* (Gmelin)

Common and widely distributed in the Lesser Slave Lake marshes, at Winagami, Cardinal, and Flood Lakes and at many other small lakes and ponds.

Shoveller. *Spatula clypeata* (Linnaeus)

Fairly common about the Lesser Slave Lake marshes; also at Winagami and Cardinal Lakes.

Redhead. *Aythya americana* (Eyton)

Observed in small numbers in the Lesser Slave Lake marshes at Buffalo Bay, Kinuso, and Joussard.

Ring-necked Duck. *Aythya collaris* Donovan

We found this duck scarce in 1950. A brood of eight was seen near Dixonville on July 1.

Canvas-back. *Aythya valisineria* (Wilson)

Observed only at Cardinal Lake, where two were seen on July 2 and one on July 16.

Lesser Scaup. *Aythya affinis* (Eyton)

A common and well-distributed species in the Lesser Slave Lake marshes and on most of the large and small lakes visited.

Specimen:

Peace River (near Battle River): 1 ad. ♂; May 21, 1921, M. Y. Williams

American Golden-eye. *Bucephala clangula americana* (Bonaparte)

Fairly common and well distributed about both large and small lakes and ponds.

Barrow Golden-eye. *Bucephala islandica* (Gmelin)

Soper (1949) observed a male at Bear Lake on June 21, 1944.

Buffle-head. *Bucephala albeola* (Linnaeus)

Noted in small numbers on lakes and sluggish streams. Downy young at Flood Lake, July 13.

Old-squaw. *Clangula hyemalis* (Linnaeus)

Macoun and Macoun (1909, p. 103) recorded a few observed by Spreadborough at Lesser Slave Lake in May, 1903.

Specimen, N.M.C.:

Peace River (20 miles below Battle R.): 1 ad. ♀; May 21, 1921, M. Y. Williams

White-winged Scoter. *Melanitta deglandi* (Bonaparte)

Observed in small numbers on Lesser Slave, Winagami, and Cardinal Lakes.

Surf Scoter. *Melanitta perspicillata* (Linnaeus)

Macoun and Macoun (1909, p. 117) say that Spreadborough saw a few on Lesser Slave Lake in 1903.

Specimens, N.M.C.:

Peace River (50 miles below Peace R. village): 1 ad. ♂; 1 ad. ♀; May 20, 1921; M. Y. Williams

Ruddy Duck. *Oxyura jamaicensis rubida* (Wilson)

Noted regularly but in small numbers on Lesser Slave, Cardinal, Winagami, and Clairmont Lakes.

American Merganser. *Mergus merganser americanus* Cassin

Observed only near Grouard where eight were seen on June 8.

Red-breasted Merganser. *Mergus serrator serrator* Linnaeus

Single adult males were observed at Faust, June 3; near Grouard, June 17; and at Cardinal Lake, July 12. The species does not seem to have been recorded previously from the region.

Eastern Goshawk. *Accipiter gentilis atricapillus* (Wilson)

A sub-adult female (probably 2 years old) was 'squeaked up' in tall balsam poplar forest 16 miles north of Grimshaw on July 10. Stomach contained remains of varying hare (*Lepus americanus*).

Specimen, N.M.C.:

Grimshaw (16 miles north): 1 sub-adult ♀; July 10

Eastern Sharp-shinned Hawk. *Accipiter striatus velox* (Wilson)

Observed about Lesser Slave Lake on June 3(1), 4(2), 6(2), 9(1), 16(1), 17(1), 20(1), August 8(1); in the Grimshaw area, July 4(1), 23(1), 29(1).

Specimen:

Grimshaw: 1 imm. ♀; July 4, 1950

Western Red-tailed Hawk. *Buteo jamaicensis calurus* Cassin

Relatively not uncommon breeder. Observed in the Lesser Slave Lake region on May 28(1); June 3(2), 8(1), 9(1), 10(1), 14(1), and in the Grimshaw region on June 30(4); July 1(2), 3(2 ad. + 2 young in nest in white spruce), 4(5), 5(1), 6(1), 7(4), 8(2), 10(2), 11(2), 12(2), 15(1), 17(2), 18(1), 19(2 ad. and 1 flying juv.), 20(1), 24(6), 25(1), 27(1), 28(2), 29(1), August 3(1). Stomach of one of the adults collected was empty; one contained a young ruffed grouse, *Bonasa umbellus*, and one a young duck. In the nest, mentioned above, were remains of a chipmunk, *Eutamias minimus*; Sharp-tailed grouse, *Pedioecetes phasianellus*; ruffed grouse, *Bonasa umbellus*; and rusty blackbird, *Euphagus carolinus*. Macoun (1909) recorded this species breeding at Peace River Landing and at Dunvegan.

Specimens:

Grimshaw: 1 ad. ♀; July 5

" (12 miles north): 1 ad. ♀; July 19

" (17 miles north): 1 ad. ♂; July 20

Dunvegan: 1 juv. ♀; September 5, 1932; L. S. Russell

The adult male is a dark phase specimen, definitely *calurus*. One of the other adults has heavily-barred tail; the other has only the outer rectrices barred.

Broad-winged Hawk. *Buteo platypterus platypterus* (Vieillot)

Singles were seen near Joussard on June 2, 3, and 18; at Hines Creek, July 18; at Sturgeon Heights and Valleyview, August 5. On August 8 two were noted at Canyon Creek, one at Slave Lake, and one at Lawrence Lake.

Swainson Hawk. *Buteo swainsoni* Bonaparte

Although this hawk does not seem to have been previously recorded from the region, it was observed by the writer in 1950 as follows: Near Joussard single birds were observed on June 3 and 14, respectively; at Grouard one on June 8; one at High Prairie on June 23; and two at Saskatoon Lake, August 4.

American Rough-legged Hawk. *Buteo lagopus s.-johannis* (Gmelin)

Macoun and Macoun (1909) state that Spreadborough saw one at Peace River Landing in 1903.

Bald Eagle. *Haliaeetus leucocephalus* subsp.

Although not previously recorded from the region, MacDonald and the writer watched two apparently first-year birds 8 miles west of Peace River Village on July 10. At Shaftsbury, on Peace River, we observed an adult on July 22, and the writer noted an adult at Cardinal Lake also on the latter date.

Marsh Hawk. *Circus cyaneus hudsonius* (Linnaeus)

In the area between High Prairie and Kinuso it was noted on June 8(2), 9(1), 10(5), 17(1), 21(2), 24(1). Within a 50-mile radius of Grimshaw on June 30(1); July 1(2), 3(4), 4(4), 5(1), 6(1), 7(2), 8(2), 10(1), 11(1), 15(2), 16(1), 17(1), 18(2), 19(1), 20(1), 21(3), 23(1), 24(4), 25(1), 26(7), 27(1), 28(3), 29(1), 30(1), 31(1). Stomach of the specimen collected contained a downy coot, *Fulica americana*.

Specimen:

Kinuso: 1 ad. ♀; June 10

Osprey. *Pandion haliaetus carolinensis* (Gmelin)

Soper (1949) observed one at the eastern end of Lesser Slave Lake in May and June, 1944. We, in 1950, saw two at Joussard on June 18, and near Slave Lake village one was seen on August 8.

Duck Hawk. *Falco peregrinus anatum* Bonaparte

Two at Cardinal Lake on July 16, 17, and 21, respectively. Soper (1949) observed one at Bear Lake, near Grande Prairie on June 23, 1944.

Pigeon Hawk. *Falco columbarius* subsp.

Single examples were seen at Cardinal Lake on July 23 and 25. A specimen observed at close range at Clairmont Lake on August 5 appeared to resemble *richardsonii* in its pale coloration. Macoun and Macoun (1909) state that Spreadborough found it common at Lesser Slave Lake in 1903. However, we found it far from common, as also did Soper (1949) in 1944.

Northern Sparrow Hawk. *Falco sparverius sparverius* Linnaeus

Soper (1949) noted it very sparingly throughout most of the territory traversed. In 1950 we found it common, as also did Spreadborough, apparently, in 1903 (Macoun and Macoun, 1909). It was observed by us at almost all localities visited north to Keg River and was recorded as follows: June 2(5), 3(6), 4(2), 5(1), 6(2), 7(7), 8(14), 9(7), 10(8), 12(9), 13(4), 14(2), 15(2), 16(5), 17(8), 18(4), 19(4), 20(6), 21(7); 22(4), 23(8), 24(9), 27(12), 30(2); July 1(3), 2(1), 3(5), 4(4), 5(2), 6(1), 7(5), 8(9), 10(4), 11(3), 12(3), 13(7), 15(4), 16(2), 17(2), 18(10), 19(1), 21(4), 22(4), 23(2), 24(15), 25(6), 26(11), 27(3), 28(11), 29(4), 31(8). It was similarly common in the Grande Prairie region, August 3 to 5. On August 8, while driving between Grande Prairie and Baptiste Lake, forty-nine were counted.

Specimens:

Joussard: 1 ad. ♀; June 19

Grimshaw: 1 ad. ♂; July 3

Spruce Grouse. *Canachites canadensis canadensis* (Linnaeus)

Trevor Lloyd described this species from birds he had seen in a muskeg near Grimshaw, and on July 24 droppings, thought to be of this species, were observed at Mile 110, Mackenzie Highway. Soper (1949) noted it at Ray Lake and near Nose Mountain.

Ruffed Grouse. *Bonasa umbellus yukonensis* ← → *umbelloides*

Rather common in the wooded parts, but apparently less so in the heavy forest about Lesser Slave Lake than in the aspen groves about

Grimshaw. In all, eighteen broods of young were seen, the earliest being noted on June 24 near Joussard.

Specimens:

Joussard: 1 ad. ♂; June 13

Grimshaw: 1 ad. ♂; 1 ad. ♀; June 30 to July 1

These specimens are intermediate between *umbelloides* and *yukonensis*. Perhaps they are closer to the latter, but no specimens of *yukonensis* in similar plumage are at hand for direct comparison. They are decidedly less rufescent and are somewhat paler than comparable specimens from farther south in Alberta.

Alaska Sharp-tailed Grouse. *Pedioecetes phasianellus caurus* Friedmann

Much commoner in the Grimshaw region than in the heavily forested country about Lesser Slave Lake. In the latter area only one was noted, this at Grouard on June 8. Common in the Grimshaw area where twenty-one broods were recorded. Stomachs of specimens collected contained dandelions, wild strawberries, and grasshoppers.

Specimens:

Peace River Village: 1 ad. ♂; June 27

Grimshaw: 2 ad. ♀; July 10 to 13

Mackenzie Highway at Meikle R.: 1 ad. ♀; July 8

These specimens are obviously nearer *caurus* than to either *jamesi* or *kennicottii*.

European Partridge. *Perdix perdix perdix* (Linnaeus)

At Smith two adults were seen on May 27, and also at Smith an adult with twelve young on August 8 and an adult with three young 3 miles east of Smith on the latter date. Our northernmost record was at "The Narrows" of Lesser Slave Lake, north of Kinuso, where on August 6 an adult and thirteen young were flushed. Soper (1949) noted it about 10 miles west of Smith in 1944.

Whooping Crane. *Grus americana* (Linnaeus)

Macoun and Macoun (1909) state that a number were observed by J. M. Macoun at Kluskun Lake, Grande Prairie, in 1903.

Little Brown Crane. *Grus canadensis canadensis* (Linnaeus)

I was informed by Trevor Lloyd that this species is a regular but not common spring and autumn migrant in the Grimshaw area.

Sora. *Porzana carolina* (Linnaeus)

In the marshes about Lesser Slave Lake it was common, the greatest number counted (mainly by calls) in a day being sixteen (June 8), 3 miles east of Joussard. Soper (1949) correctly says that his not observing it north of Peace River was fortuitous, for we noted it at Cardinal Lake, Three Lakes, Whitemud River, Fairview, Flood Lake, and at one or two other localities all north of Peace River.

Specimens:

Joussard: 1 ad. ♀; June 8, 1950

Peace River Landing: 1 ad. ♂; June 24, 1903, W. Spreadborough

American Coot. *Fulica americana americana* Gmelin

Fairly common breeder in marshes about lakes and larger sloughs in the Lesser Slave Lake and Grimshaw areas. Decidedly commoner in the

Grande Prairie areas and at Sturgeon Lake. A downy young was taken from the stomach of a Marsh Hawk near Joussard on June 10.

Semipalmated Plover. *Charadrius hiaticula semipalmatus* Bonaparte

Migrant. First seen on July 11(5) at Cardinal Lake where numbers gradually increased to 55 on July 27. Two near Joussard on August 5.

Specimens:

Cardinal Lake: 1 ad. ♂, 1 ad. ♀; July 17, 1950

Killdeer. *Charadrius vociferus vociferus* (Linnaeus)

Fairly common breeder; observed about the marshes of most lakes, ponds, and streams throughout the region. Preble (1908) recorded the breeding of this species at Lesser Slave Lake in 1868.

Specimens:

Cardinal Lake: 1 ad. ♂; 1 juv. ♂; July 24, 1950

Black-bellied Plover. *Squatarola squatarola* (Linnaeus)

Migrant. Noted at Cardinal Lake, July 23(2), 25(1), 27(12), 28(5), 30(1); and at High Prairie, August 8(1)

Wilson Snipe. *Capella gallinago delicata* (Ord)

Soper (1949) found it apparently extremely scarce and widely scattered, observing a total of only four in 1944. In 1950 it was noted near Joussard on June 7(1), 8(3), 9(5), 12(1), 20(1), August 5(3); near Faust on June 19(2) and August 6(4); near Grimshaw, July 1(1), 7(2), 11(1), 12(1), 14(1), 15(1), 22(1), 30(1); Flood Lake, July 13(1); Clairmont Lake, August 5(2); Clarke (MS.) says, "In the Lesser Slave marshes in the second week of September (1930) it was found in numbers amazing to a resident of Ontario. . . ."

Upland Plover. *Bartramia longicauda* (Bechstein)

Like Soper (1949) we found this species uncommon. In 1950, one was heard near Grimshaw on June 30, and eight were seen 4 miles west of Dixonville on July 29. The behaviour of adults suggested breeding.

Specimen:

Dixonville (4 mi. west): 1 ad. ♂; July 28, 1950

Spotted Sandpiper. *Actitis macularia* (Linnaeus)

Generally distributed breeder. Noted about margins of lakes, ponds, and streams throughout the areas visited. Earliest observed nest, June 15 (3 eggs) near Joussard.

Specimens:

Joussard: 1 ad. ♂, 1 ad. ♀; June 15, 1950

Eastern Solitary Sandpiper. *Tringa solitaria solitaria* Wilson

As this species was not recorded by Soper (1949), our 1950 observations are given in detail: Joussard, June 3(1), 16(2), August 5(6); Cardinal Lake, July 3(5), 17(1), 19(6), 21(8), 22(1), 23(4), 25(16), 27(1), 28(4), 30(6). Noted also at Meikle River, July 8(1); Mackenzie Highway, Mile 11, July 10 (one, the actions of which suggested breeding), July 11(1); Mackenzie Highway, Mile 110, July 24(2). Observed also at Flood Lake,

Fairview, Dixonville, Grande Prairie, and Sturgeon Lake. The nesting of this species at Peace River was recorded by Henderson (1923).

Specimens:

Joussard: 2 ad. ♂; June 16, 1950

Grimshaw: 2 ad. ♂; July 7-11, 1950

Mackenzie Highway, Mile 110: 1 ad. ♂; July 24, 1950

Greater Yellow-legs. *Totanus melanoleucus* (Gmelin)

Although Macoun and Macoun (1909) say that Spreadborough found it common on the shores of nearly all the lakes between Lesser Slave Lake and Peace River Landing, Soper (1949) and we found it uncommon. We noted it at Grouard, June 8(1); Kinuso, June 16(1) and August 6(1); Cardinal Lake, July 27(1), 28(2), 30(1); Grande Prairie, August 3(1), 4(1); Sturgeon Lake, August 5(1); Joussard, August 5(1).

Specimen:

Cardinal Lake: 1 imm. ♀; July 21, 1950

Lesser Yellow-legs. *Totanus flavipes* (Gmelin)

A common breeder. Noted at most of the lakes, sloughs, and wet muskegs visited. Largest number observed at Cardinal Lake, July 23 (225).

Specimens:

Cardinal Lake: 3 ad. ♂, 1 juv.; July 11 to 25, 1950

Pectoral Sandpiper. *Erolia melanotos* (Vieillot)

Soper (1949) observed six at the east end of Lesser Slave Lake on June 1, 1944, but saw no others. In 1950, we saw one near Grouard on June 1; at Cardinal Lake it was recorded on July 16(10), 17(21), 19(14), 21(17), 22(11), 23(12), 25(45), 27(12), 28(13), 29(1), 30(1).

Specimen:

Grimshaw: 1 ad. ♂; July 17, 1950

Baird Sandpiper. *Erolia bairdii* (Coues)

At Cardinal Lake it was first noted by the writer on July 2. Numbers gradually increased and 175 were seen there July 30. Soper (1949) noted it similarly and saw also, evidently, the last of spring migrants on June 1, 1944.

Specimens:

Cardinal Lake: 3 ad. ♂, 1 ad. ♀; July 11 to 27, 1950

Least Sandpiper. *Erolia minutilla* (Vieillot)

Migrant. Observed in small numbers at Cardinal Lake and at Joussard. First noted on July 3.

Long-billed Dowitcher. *Limnodromus scolopaceus* (Say)

Migrant. Dowitchers were observed on shallow edges of Cardinal and Flood Lakes and at a shallow pond near Dixonville. Noted on July 11(38), 12(87), 13(8), 15(26), 17(20), 19(6), 21(26), 23(37), 25(10), 27(14), 28(16), 29(3), 30(35); at Grande Prairie one was seen on August 3 and 4. All appeared to be adults.

Specimens:

Cardinal Lake: 3 ad. ♀, 1 ad. ♂; July 11 to 21, 1950

Dixonville: 1 ad. ♂; July 29, 1950

Two males measure respectively: wing, 142.5, 139.5; exposed culmen, 61.2, 61.5. Three females: wing, 142.5, 137.5, 146.5; exposed culmen, 69, 70, 73 mm. In plumage characters, too, they are unquestionably referable to *scolopaceus*.

[Inland Dowitcher. *Limnodromus griseus hendersoni* Rowan. Bent (1927) says that eggs have been taken just south of Little (= Lesser?) Slave Lake. Presumably these would refer to this species and race. Probably Soper's (1949) record of one at Sturgeon Lake on June 14, 1944, also refers to this race. Probably some of the dowitchers listed under the preceding species were short-bills too, for most were not identifiable in the field.]

Stilt Sandpiper. *Micropalama himantopus* (Bonaparte)

Migrant. Inasmuch as this species does not seem to have been previously recorded from the region, our 1950 records, all at Cardinal Lake, are given in detail: July 15(2), 16(12), 17(1), 21(8). All were adults.

Specimen:

Cardinal Lake: 1 ad. ♂; July 17, 1950

Semipalmated Sandpiper. *Ereunetes pusillus* (Linnaeus)

Common at Cardinal Lake after July 2 where it outnumbered *Erolia minutilla* considerably. At Flood Lake twenty-five were noted on July 13.

Specimen:

Cardinal Lake: 1 ad. ♂; July 11, 1950

Sanderling. *Crocethia alba* (Pallas)

Macoun and Macoun (1909) state that Spreadborough saw three at Lesser Slave Lake, but no additional data are given.

American Avocet. *Recurvirostra americana* Gmelin

Preble (1908) states that the catalogue of birds in the United States National Museum records two specimens from Peace River as well as one taken at Lesser Slave Lake, probably in 1868. Eggs from the same locality, he says, are in the United States National Museum.

Wilson Phalarope. *Steganopus tricolor* Vieillot

Uncommon breeder. Noted at Grouard June 9(1); near McLennan, June 12(1); Cardinal Lake, July 11(2); 12(2), 15(1). Soper (1949) saw downy young at Bear Lake on June 12, 1944.

Specimen:

Cardinal Lake: 1 ad. ♂; July 11, 1950

Northern Phalarope. *Lobipes lobatus* (Linnaeus)

This species, apparently not previously recorded from the region concerned, was observed usually in small flocks at Cardinal Lake as follows: July 7(42), 12(6), 21(5), 25(5), 27(2).

Specimen:

Cardinal Lake: 1 ad. ♂; July 21, 1950

Herring Gull. *Larus argentatus smithsonianus* Coues

My observations are similar to those of Soper (1949). I saw this species in small numbers near Kinuso, Faust, Jousard, Cardinal Lake, and Bezanson. No evidence of breeding.

California Gull. *Larus californicus* Lawrence

Small numbers, mostly immatures, were noted on Lesser Slave Lake, June 6 to 24, thirty-three being identified at Faust on June 10. Singles were noted on three July dates at Cardinal Lake, and one was seen at Clairmont Lake, August 4.

Specimens:

Joussard: 3 imm. ♂; June 9 to 20, 1950

Ring-billed Gull. *Larus delawarensis* Ord

Noted at Faust and at Cardinal Lake. Largest number was seen at Cardinal Lake, twelve on July 25.

Short-billed Gull. *Larus canus brachyrhynchus* Richardson

The writer saw one, apparently an adult, at 30 yards at Cardinal Lake on July 12. Soper (1949) also saw one at the east end of Lesser Slave Lake, June 2, 1944.

Franklin Gull. *Larus pipixcan* Wagler

It is difficult to account for the fact that Soper (1949) observed this species only twice in 1944. In 1950 we found it at all the larger lakes visited and on or over many of the fields. It was by far the commonest gull, at times abundant. Near Joussard it was seen on June 8(150), 11(55), 13(3), 17(40), 18(45), 19(120), 20(12), 21(180), 22(180), 23(80), 24(308); High Prairie, June 27(475), August 7(45); Grouard, June 9(75); at "The Narrows", near Kinuso, June 10(15), August 6 (approx. 4,000); Faust, June 10(24), 16(100), 19(22); Grimshaw region (largest numbers at Cardinal Lake), June 28(12), 29(10), 30(17), July 1(9), 2(750), 3(650), 4(2), 5(25), 6(30), 7(900), 8(27), 10(10), 11(380), 12(300), 13(16), 15(375), 16(140), 17(150), 18(4), 19(50), 20(12), 21(95), 22(5), 23(60), 25(25), 26(4), 27(40), 28(25), 30(27); Sturgeon Lake, August 5(18). Although five of the specimens listed below had brood patches, we saw no nests. At Cardinal Lake, numbers decreased rapidly after mid-July and at the same time numbers of Bonaparte Gulls increased.

Specimens:

Joussard: 3 ad. ♂; 3 ad. ♀; June 22, 1950

Bonaparte Gull. *Larus philadelphia* (Ord)

Observed at Grouard, June 9(2); at Cardinal Lake, July 2(2), 12(2), 16(45), 17(70), 19(40), 21(85), 23(104), 25(75), 27(145), 28(275), 30(100); Mackenzie Highway, Mile 90, July 24(5); Sturgeon Lake, August 5(40); "The Narrows", near Kinuso, August 6(300).

Common Tern. *Sterna hirundo hirundo* Linnaeus

Uncommon. Noted in small numbers at Grouard, Faust, near Kinuso, Sturgeon Lake, Joussard, and Canyon Creek. No breeding evidence.

Black Tern. *Chlidonias niger surinamensis* (Gmelin)

Common breeder. Noted at most lakes visited. First flying young on July 15 at Cardinal Lake. Specimen listed below had egg in oviduct.

Specimen:

Joussard: 1 ad. ♀; June 8, 1950

Mourning Dove. *Zenaidura macroura* subsp.

Rare. Macoun and Macoun (1909) state that Spreadborough saw one between Lesser Slave Lake and Peace River in 1903. Soper (1949) saw one at the southeastern end of Lesser Slave Lake in late May, 1944.

Arctic Horned Owl. *Bubo virginianus subarcticus*¹ Hoy

Breeds. Noted at Jousard and along Mackenzie Highway at Miles 16, 17, and 75. Two young on the ground at Jousard on June 23 were just able to fly. Stomach of the Mackenzie Highway specimen, taken at dusk, contained remains of a Varying Hare and a coleopterous insect. Stomach of Jousard specimen empty.

Specimens:

Mackenzie Highway, Mile 16: 1 ad. ♂; July 25, 1950

Jousard: 1 ad. ♂; August 5, 1950

Snowy Owl. *Nyctea scandiaca* (Linnaeus)

Trevor Lloyd told the writer that this species occurs occasionally at Grimshaw in winter. A mounted specimen was seen in a store at Wembley.

American Hawk Owl. *Surnia ulula caparoch* (Müller)

Noted but twice; single birds 8 and 13 miles, respectively, north of Grimshaw on July 21 and 28. According to Macoun and Macoun (1909), Spreadborough found it common between Lesser Slave Lake and Peace River in 1903. As Soper (1949) in 1944 did not record it and we saw but two in 1950, it may have decreased in settled parts of the region. Of two stomachs, one was empty, and one contained a few feathers of a passerine bird.

Specimens:

Peace River Landing: 1 ad. ♀; June 26, 1903 (Spreadborough)

Grimshaw, 8 to 13 miles north: 1 ad. ♂, 1 imm. ♀; July 21 to 28, 1950

Great Gray Owl. *Strix nebulosa nebulosa* Forster

Macoun and Macoun (1909) say Spreadborough saw one at Lesser Slave Lake and another between there and Peace River Landing in 1903.

Western Long-eared Owl. *Asio otus tuftsi* Godfrey

Observed within 10 miles of Grimshaw as follows: July 13(2), 15(1), 27(2), 28(1). It does not seem to have been previously recorded from this region. Of four specimens collected, three stomachs were empty; the other contained a mouse (*Microtus*) and 13 moths.

Specimens:

Grimshaw: 2 ad. ♂, 2 ad. ♀; July 13 to 28, 1950

Two males and a female show the markedly pale colour characters of this race. The other female is somewhat darker but is paler than average *wilsonianus*.

Short-eared Owl. *Asio flammeus flammeus* (Pontoppidan)

A single specimen at Cardinal Lake on July 27 was our only observation. Soper (1949) recorded it three times in 1944. It has been recorded also by Macoun and Macoun (1909) and Preble (1908).

¹ *B. v. wapacuthu* of A. O. U. Supplement (Aug, 1944, p. 450).

Eastern Nighthawk. *Chordeiles minor minor* (Forster)

Soper (1949) noted it "sparingly and irregularly" throughout most of the region we covered. We noted it daily in numbers varying from one to twenty-seven in a day. On August 5 we counted thirteen dead birds on the highway between Sturgeon Lake and High Prairie. A nest near Grimshaw on July 7 contained two young, the eyes of which had not yet opened. In Grimshaw one was observed perched crosswise like a swallow on a telephone wire on July 27.

Specimens:

Grimshaw: 6 ad. ♂, 3 ad. ♀; July 3 to 28, 1950

Ruby-throated Hummingbird. *Archilochus colubris* (Linnaeus)

Although Soper (1949) did not personally observe this species, he was informed by local residents that it occurs in the region. We noted nine individuals within a radius of 10 miles of Jousard as follows: May 31(1); June 4(1), 5(2), 6(2), 14(1), 18(1), 20(1).

Specimens:

Jousard: 1 ad. ♂, 1 ad. ♀; June 5, 1950

Belted Kingfisher. *Megasceryle alcyon* subsp.

Our observations confirm Soper's (1949) findings that this species is rare. We saw only one on Peace River, at Shaftsbury, July 22.

Boreal Flicker. *Colaptes auratus borealis* Ridgway

This common breeding species was observed daily in numbers varying from two to twenty-one.

Specimens:

Grimshaw: 3 ad. ♂, 3 ad. ♀; July 1 to 5, 1950

Jousard: 1 ad. ♀; June 15, 1950

Hybrid Flicker. *Colaptes auratus borealis* x *C. cafer collaris*

In addition to the two specimens listed below, MacDonald and the writer saw on several dates in early July a specimen with reddish wings near Grimshaw, presumably the same individual.

Specimens:

Jousard: 1 ad. ♂; June 19, 1950

Grimshaw: 1 ad. ♂; July 6, 1950

Both specimens are similar to *auratus*; but the Jousard bird has a few red feathers in the black malar stripe, and the Grimshaw specimen has a few black feathers in a red malar stripe.

Northern Pileated Woodpecker. *Dryocopus pileatus abieticola* (Bangs)

Near Jousard we saw on trees what was almost certainly the work of this woodpecker. Mr. D. Barnes, of Enilda, described in detail this bird which he called 'Woodcock'. He saw one at Enilda in winter, 1948, and saw another there earlier. Soper (1949) heard one at Mitsue Lake.

Lewis Woodpecker. *Asyndesmus lewis* (Gray)

In a letter to P. A. Taverner, T. E. Randall, a competent observer, reported seeing a Lewis Woodpecker on the north shore of Lesser Slave Lake on May 28, 1928. He was able to approach to within "a few yards of it."

Yellow-bellied Sapsucker. *Sphyrapicus varius varius* (Linnaeus)
Common breeder. Noted in almost all wooded localities studied.

Specimens:

Joussard: 1 ad. ♂, 4 ad. ♀; June 5 to 20, 1950
Grimshaw: 1 ad. ♂; July 4, 1950

Northern Hairy Woodpecker. *Dendrocopos villosus septentrionalis*
(Nuttall)

Breeds. Observed in daily numbers of from one to six in forests about Joussard. Young almost ready to leave nest June 19. Perhaps somewhat scarcer about Grimshaw where one's and two's were seen on ten July dates. One at Sturgeon Lake, August 5.

Specimens:

Joussard: 1 ad. ♂; June 9, 1950
Grimshaw: 1 ad. ♂, 1 ad. ♀, 1 imm.; July 5 to 8, 1950
Mackenzie Highway at Meikle R.: 1 ad. ♂; July 8, 1950

Nelson Downy Woodpecker. *Dendrocopos pubescens nelsoni* (Oberholser)

Scarcer than preceding species. Macoun and Macoun (1909) do not mention its occurrence, and Soper (1949) saw but two. Preble (1908) reports specimens taken near Peace River on June 7, 8, and 10, 1901. We recorded fifteen between June 2 and August 7, 1950, near Joussard and Grimshaw.

Specimens:

Joussard: 1 ad. ♀; June 12, 1950
Grimshaw: 2 juv. ♀, 1 juv. unsexed; July 6 to 15, 1950

Alaskan Three-toed Woodpecker. *Picoides tridactylus fasciatus* Baird
Soper (1949) saw four at Sturgeon Lake, June 10 to 15, 1944.

Western Kingbird. *Tyrannus tyrannus hespericola* Oberholser

Common. Observed in daily numbers varying from one to thirty-eight. Noted north along Mackenzie Highway to Keg River. At Cardinal Lake young were ready to leave the nest on July 12.

Specimens:

Joussard: 1 ad. ♂, 1 ad. ♀; June 15, 1950
Grimshaw: 1 ad. ♂; July 8, 1950

Because of the slightly more greyish dorsal coloration of these specimens, compared with birds from eastern Canada, I refer them to the lightly defined but apparently recognizable race *hespericola*.

Eastern Phoebe. *Sayornis phoebe* (Latham)

Rather common breeder throughout. Five nests noted on buildings or under bridges. Observed north to Keg River where breeding.

Specimens:

Grouard: 1 ad. ♂, 1 ad. ♀; June 8, 1950
Joussard: 1 ad. ♂; June 6, 1950
Sturgeon Lake: 1 juv.; August 5, 1950

The Sturgeon Lake specimen is albinistic.

Say Phoebe. *Sayornis saya* subsp.

Observed only once; a solitary male about a log cabin, 13 miles west of Dixonville. Not previously recorded from the region.

Specimen:

Dixonville (13 miles west): 1 ad. ♂; July 26, 1950

It is too worn to permit certain subspecific identification.

Yellow-bellied Flycatcher. *Empidonax flaviventris* (Baird and Baird)

Soper (1949) observed two. Near Jousard the writer heard two on June 6.

Alder Flycatcher. *Empidonax traillii traillii* (Audubon)

Fairly common in willow-alder thickets. Noted regularly in daily numbers varying from one to eight.

Specimens:

Lesser Slave Lake: 3 ad. ♂; June 10 to 14, 1950

High Prairie: 2 ad. ♂; June 24, 1950

Grimshaw: 1 ad. ♂; July 28, 1950

Measurements: wing, 69.3–75.0 (av. 72.6); tail, 56.0–59.6 (av. 58.2) mm.

Least Flycatcher. *Empidonax minimus* (Baird and Baird)

Very common. Observed in daily numbers varying between two and twenty-eight.

Two nests almost completed on June 1.

Specimens:

Jousard: 4 ad. ♂, 1 ad. ♀; June 3 to 15, 1950

Grimshaw: 2 ad. ♂, 1 ad. ♀; July 1 to 8, 1950

Hines Creek: 1 juv.; July 18, 1950

Notikewin River: 1 juv. unsexed; July 27, 1932, L. S. Russell

[Hammond Flycatcher. *Empidonax hammondii* (Xantus). Baird, Brewer, and Ridgway (1874) state that a number of nests and eggs with parent birds were taken by Strachan Jones from Lesser Slave Lake. Preble (1908) says that the U.S. National Museum* catalogue records a specimen from there. Ridgway (1907) includes "Little Slave Lake" in the range of this species as also does Bent (1942). Apparently no one else has encountered this species in the region and its regular occurrence would seem surprising. The writer has seen no specimens. These records appear to be erroneous.]

Western Wood Pewee. *Contopus richardsonii richardsonii* (Swainson)

Fairly common breeder. Noted throughout in suitable habitat in daily numbers varying from two to eleven. Eggs being incubated at one nest, June 23; in another there were recently hatched young, July 3.

Specimens:

Jousard: 3 ad. ♂, 1 ad. ♀; June 3 to 15, 1950

Grimshaw: 1 ad. ♂, 1 ad. ♀; July 7 to 11, 1950

Olive-sided Flycatcher. *Nuttallornis borealis* (Swainson)

Rather common summer resident in both the Lesser Slave Lake and the Grimshaw areas.

Specimens:

Jousard: 1 ad. ♂; June 17, 1950

Grimshaw: 2 ad. ♀; July 4 to 15, 1950

Wings measure (in mm.): male, 108; females, 102.8, 103.0.

* Mr. Allen J. Duvall has since informed me (in litt.) that he can now find no such specimens in the U.S. National Museum. He considers it probable that Ridgway (1907) and Bent (1942) based their Lesser Slave Lake records of this species on the statement appearing in Baird, Brewer, and Ridgway (1874).

Horned Lark. *Eremophila alpestris* subsp.

Soper (1949) says that a few pass through the Grande Prairie–Peace River district in migration. Like him, however, we too were unable to find a single individual, although much of the country appears to be ideal for breeding of this species.

Tree Swallow. *Iridoprocne bicolor* (Vieillot)

Common breeder. Latest observation, August 4 (eight at Clairmont Lake). About 450 were noted roosting in bulrush edges of Cardinal Lake, July 22.

Specimens:

Grimshaw: 1 ad. ♂; July 10, 1950

Mackenzie Highway at Meikle River: 1 ad. ♂; July 8, 1950

Bank Swallow. *Riparia riparia riparia* (Linnaeus)

Although Macoun and Macoun (1909) say that Spreadborough found it common between Lesser Slave Lake and Peace River, Soper (1949) and we did not find it so. We saw a small breeding colony along East Prairie River and noted the species also at Faust, June 10(3); Manning, July 30(6); and at High Prairie, August 5(3).

[Barn Swallow. *Hirundo rustica erythrogaster* Boddaert. Although this species was carefully looked for, we failed to find it in 1950. It was not recorded by Soper (1949) or Preble (1908); and Cowan (1939) did not note it in the Peace River area of British Columbia. The only record is a sight one of two seen by Spreadborough at Lesser Slave Lake in June, 1903 (Macoun and Macoun, 1909)].

Greater Cliff Swallow. *Petrochelidon pyrrhonota hypopolia* Oberholser

Observed at High Prairie, Faust, Grouard, Manning, Peace River, Cardinal Lake, Dixonville, Bluesky, Keg River, and Grande Prairie. Nesting at Grouard, Faust, near Cardinal Lake, Grimshaw, and Keg River. At Keg River ninety-one nests were counted under a bridge. As no specimens were taken, these populations are referred to *hypopolia* on geographical grounds only.

Northern Purple Martin. *Progne subis subis* (Linnaeus)

Observed in small numbers (1 to 12) at Joussard, High Prairie, Dixonville, North Star, and Grimshaw. Nesting in bird boxes, 10 miles west of Dixonville, July 26.

Specimen:

High Prairie (12 miles west): 1 juv. ♀; August 5, 1950

Alberta Canada Jay. *Perisoreus canadensis albescens* Peters

Noted mostly in coniferous-deciduous or pure coniferous woods, in which habitats it is not uncommon. Juvenals still 'begging' food, June 16.

Specimens:

Joussard: 1 ad. ♀, 1 juv.; June 3 to 9, 1950

Grimshaw (12 to 110 miles north): 2 ad. ♂, 2 ad. ♀; July 19 to 28, 1950

Northern Blue Jay. *Cyanocitta cristata bromia* Oberholser

Noted at Joussard, May 31(1); Enilda, June 2(1), 9(1), 20(2); Grouard, June 8(1); Faust, June 10(1); Kinuso, June 16(1); Grimshaw,

July 6(6), 11(2), 22(1), 29(1); 10 miles north of Grimshaw, July 15(1); 16 miles north of Grimshaw, July 21(1); Baptiste Lake, August 8(6). Soper (1949) also observed this species in several localities.

Specimens:

Kinuso: 1 year-old ♂; June 16, 1950

Grimshaw: 1 ad. ♀, 2 juv. ♀; July 6, 1950

These specimens are considerably darker than a specimen in the National Museum from Lac la Nonne which, as Sutton (1935) pointed out, resembles *cyanotephra*. The latter appears to be aberrant; the others are referable to *bromia*.

American Magpie. *Pica pica hudsonia* (Sabine)

Noted at High Prairie, Enilda, Grouard, Faust, Kinuso, McLennan, Peace River, Grimshaw (regularly in small numbers), Flood Lake, Clairmont Lake, and Baptiste Lake. Largest daily number was ten, north of Kinuso, June 10. Preble (1908) recorded two specimens probably from Lesser Slave Lake.

Specimens:

Grimshaw: 1 ad. ♂; 1 juv. ♂; July 5 to 26, 1950

Northern Raven. *Corvus corax principalis* Ridgway

Near Joussard it was noted regularly but not more than three were seen in a day. Noted also south of North Star, July 8(2) and along Mackenzie Highway near Keg River, July 24(6). It was seen nowhere near Grimshaw.

Western Crow. *Corvus brachyrhynchos hesperis* Ridgway

Noted regularly in daily numbers between 2 and 106. It was not observed in the heavily forested country north of Hotchkiss on the Mackenzie Highway.

Specimens:

Grimshaw: 1 ad. ♂, 1 ad. ♀; July 11 to 13, 1950

Faust: 1 ad. ♀; June 21, 1950

Joussard: 1 ad. ♀; June 21, 1950

Measurements of above specimens (in mm.): 1 male, wing, 307.0; exposed culmen, 50.0; depth of culmen at nostril 17.2; tarsus, 60.0. Three females: wing, 288-296.5; exposed culmen, 43.0-44.5; tarsus, 54.5-56.0. Rand (1948) gave wing and culmen measurements of six males and two females taken between Lac la Nonne and Red Deer River, Alberta. These measurements when averaged with those of our 1950 specimens listed above are as follows: male (average of 7) 310 mm.; exposed culmen, 49.4 mm. Female (average of 5), wing, 295.5; exposed culmen, 43.7. Rand considered northern Alberta crows south to Red Deer intermediate but closer to the nominate race. Comparing the measurements with those of Ridgway (1904) for the two races, this population seems definitely closer to *hesperis*. While it is true that the bill of the Grimshaw male is within the size range of the nominate race, it is in slenderness definitely nearer *hesperis*. The females are quite typical *hesperis*, the males closer to it than to the nominate race.

Long-tailed Chickadee. *Parus atricapillus septentrionalis* Harris

Fairly common breeder. Noted in daily numbers varying between one and sixteen throughout the area surveyed. First flying young noted June 16.

Specimens:

Joussard: 3 ad. ♂, 1 ad. ♀; June 5 to 20, 1950

Grimshaw: 1 juv.; July 7, 1950

Alberta Boreal Chickadee. *Parus hudsonicus farleyi* Godfrey

Uncommonly noted in coniferous forest near Joussard, McLennan, Grimshaw, and Dixonville, north to Mile 110, Mackenzie Highway.

Specimens:

Joussard: 1 ad. ♀; June 23, 1950

Grimshaw (10 to 16 miles north): 1 ad. ♂, 1 ad. unsexed, 1 juv. ♀; June 30 to July 15, 1950

Mackenzie Highway, Mile 110: 1 juv. ♂; July 24, 1950

This race was recently described by the writer (1951).

Red-breasted Nuthatch. *Sitta canadensis* Linnaeus

Not uncommon in coniferous or mixed forests about Lesser Slave Lake, along the Mackenzie Highway north to Mile 110, and at Sturgeon Lake. On June 4 a nest was being excavated.

Specimens:

Joussard: 1 ad. ♂, 1 ad. ♀; June 2, 1950

Grimshaw, 16 miles north: 1 juv.; July 19, 1950

Western House Wren. *Troglodytes aedon parkmanii* Audubon

A common breeding species, noted in all localities visited and north to Keg River, Mackenzie Highway. A pair built a nest and laid five eggs in the door of an old automobile at Joussard. During hot afternoons the sun heated this metal 'bird box' so intensely that, in sunny weather, the birds were seen to remain inside for only a couple of minutes at a time, quickly emerging with open bill. At 7 p.m. on June 24, with outside temperature 68° F., the nest temperature was 120° F. The eggs never hatched. At Grimshaw a House Wren persisted in dropping sticks from the centre pole of a tent down between the tent roof and the fly. They dropped down to the ground and about a peck of sticks accumulated there before the bird gave up. Another nest was noted in the twine holder of an old grain binder.

Specimens:

Joussard: 2 ad. ♂; June 15 to 19, 1950

Grimshaw: 4 ad. ♂, 2 ad. ♀; July 1 to 27, 1950

[Winter Wren. *Troglodytes troglodytes* subsp. Although Macoun and Macoun (1909) say that it was common in "thick spruce woods" from Lesser Slave Lake to Peace River Landing in June, 1903, neither Preble (1908), Soper (1949), nor we recorded it. However, we saw few areas of thick spruce woods between Lesser Slave Lake and Peace River, and perhaps there was more such habitat available when the Macoun observations were made.]

Alberta Marsh Wren. *Telmatodytes palustris iliacus* Ridgway

We noted it only at the western end of Lesser Slave Lake, at Clairmont Lake, and Sturgeon Lake. Soper (1949) gives other localities. Macoun and Macoun (1909) recorded it as breeding at Peace River Landing, and Preble (1908) recorded eggs from Lesser Slave Lake.

Catbird. *Dumetella carolinensis* (Linnaeus)

At Joussard on June 14 the writer's attention was attracted by the song of a Catbird and I was able to approach to within 25 feet of the bird as it sat in the upper branches of a willow-alder tangle near our tents. Both the song and the bird's appearance were observed under ideal conditions, and there could not be the slightest doubt about the identification. Before a collecting gun could be secured, the bird nose-dived into the lower shrubbery, and although its 'mewing' notes were heard once or twice again as the tangle was searched, I did not see it thereafter. This occurrence is not so surprising considering that the breeding of this species has been recorded near Athabasca by Randall (1933).

Eastern Robin. *Turdus migratorius migratorius* Linnaeus

A fairly common breeding species throughout the region.

Specimens:

Joussard: 1 ad. ♂; June 5, 1950

Mackenzie Highway, Mile 110: 1 ad. ♀; July 24, 1950

They are clearly referable to the nominate race.

Eastern Hermit Thrush. *Hylocichla guttata faxoni* Bangs and Penard.

About Joussard it appeared scarcer than the following species and certainly it was more local. Apparently it was relatively commoner along the southern Mackenzie Highway. On July 4, one was seen feeding a juvenal Cowbird. Last song heard July 29.

Specimens:

Grimshaw: 2 ad. ♂; 1 juv. ♀; July 5 to 19, 1950

Olive-backed Thrush. *Hylocichla ustulata swainsoni* (Tschudi)

A fairly common breeding species throughout the wooded parts of the region. A nest 5 feet up in a dead willow near Joussard contained three eggs on June 14.

Specimens:

Joussard: 6 ad. ♂, 1 ad. ♀, 1 ad. unsexed; June 1 to 15, 1950

Grimshaw: 2 ad. ♂, 1 ad. ♀; July 5 to 10, 1950

[Willow Thrush. *Hylocichla fuscescens salicicola* Ridgway. Farley (1917) said he heard a few of the 'Wilson Thrush' at Grande Prairie. He did not record the Olive-backed and Hermit Thrushes. Since neither Cowan (1939), Soper (1949), nor we have evidence of the occurrence of this species, it seems best to regard it hypothetical.]

Mountain Bluebird. *Sialia currucoides* (Bechstein)

About Joussard it was not seen, but in the more open country about High Prairie as many as nine were noted in a day. In the Grimshaw region it was seen almost daily (1 to 7 in a day). A flock of sixteen at Sexsmith on August 4. A nest was noted near Grimshaw on July 6, but its contents were not determined.

Specimens:

Grimshaw: 1 ad. ♂; July 6, 1950

Dixonville, 13 miles west: 1 juv. ♂; July 26, 1950

Eastern Golden-crowned Kinglet. *Regulus satrapa satrapa* Lichtenstein

Our only observation was of a family group at Mile 110, Mackenzie Highway, in tall white spruce forest on July 24. One specimen was shot

but lost. Soper (1949) seems to be the only other who has observed this species in the region. He noted it at Sturgeon, Sinclair, Kimawan, and Winagami Lakes.

Eastern Ruby-crowned Kinglet. *Regulus calendula calendula* (Linnaeus)

Of the two Kinglets, Soper (1949) found this notably scarcer than the preceding species. Oddly enough we found it notably commoner. Supporting this, Macoun and Macoun (1909) found it commonly in June, 1903, in spruce woods but did not record *satrapa*. It was noted by us in spruce bogs near Joussard, in a number of areas along Mackenzie Highway, and at Slave Lake.

Specimens:

Joussard: 1 ad. ♂; June 7, 1950

Grimshaw: 4 ad. ♂, 1 ad. ♀, 1 ad. unsexed; July 1 to 13, 1950

American Pipit. *Anthus spinoletta* subsp.

Clarke (MS.) noted this migrant at Slave Lake village in September, 1930.

Sprague Pipit. *Anthus spragueii* (Audubon)

One of the surprises of the expedition was the finding of this species so far north. On July 29, the writer heard the song over an open field 4 miles west of Dixonville, about 18 miles north of Grimshaw. Five singing males were counted there, one of which was collected. On July 31 the area was again visited, and twelve individuals, adults and juvenals, were counted. Two of the juvenals collected are stub-tailed and were hardly capable of flight, eliminating any doubt that they were hatched there. This is a considerable northwestward extension of the known breeding range of this species. The northernmost previously recorded breeding seems to be for Athabasca (Randall, 1933).

Specimens:

Dixonville, 4 miles west: 1 ad. ♂, 1 ad. ♀, 3 juv. ♂, 2 juv. ♀, 1 juv. unsexed;
July 29 to 31, 1950

Bohemian Waxwing. *Bombycilla garrula pallidiceps* Reichenow

Soper (1949) tentatively referred to this species a pair of waxwings he saw at Flood Lake. MacDonald also suspected that he saw an individual of this species on July 1, 1950, near Grimshaw. On the evening of July 29, the writer recognized a solitary individual which was actively pursuing insects, flying from tree to tree in an extensive muskeg near Grimshaw. Due to difficult walking and the activity of the bird, the writer could not approach close enough to collect it in an hour's effort, but there was opportunity to observe the white wing areas and the extensive black of throat through 8 X binoculars.

Cedar Waxwing. *Bombycilla cedrorum* Vieillot

Fairly common throughout the region. A nest was being constructed at Joussard on June 16.

Specimen:

Grimshaw: 1 ad. ♂; July 5, 1950

White-rumped Shrike. *Lanius ludovicianus excubitorides* Swainson

One was seen by MacDonald beside the road between High Prairie and Joussard on May 30. The writer saw one near High Prairie on a

telephone wire on June 2. On June 17, MacDonald and the writer saw apparently another, 5 miles east of Enilda, which was collected by MacDonald. It is an adult female with enlarged ovaries. Apparently this species has not previously been recorded much north of the Edmonton region, although there is a female in the National Museum from a point 10 miles north of Boyle, about 90 miles north of Edmonton, collected by T. E. Randall. Our 1950 observations seem to be the northernmost records of the species in Alberta.

Specimen:

Enilda, 5 miles east: 1 ad. ♀; June 17, 1950

It is unquestionably referable to *excubitorides*.

Starling. *Sturnus vulgaris vulgaris* Linnaeus

Although not previously recorded from the region, we observed the Starling in 1950 as follows: On June 19, MacDonald and the writer, on following an adult carrying food at Faust, found a total of seven, mostly juvenals just out of the nest. At Peace River Village the writer saw an adult on June 27 and on July 10, a juvenal. He saw an adult at Grimshaw, July 5, and two juvenals 8 miles west of Grimshaw on July 25. The northernmost record is of a flock of thirty, mostly immatures, noted by MacDonald near Meikle River at about Mile 71, Mackenzie Highway, on July 8. One of these he collected. These records provide a considerable extension of the known range of the species.

Specimen:

Mackenzie Highway, Mile 71: 1 juv. ♀; July 8, 1950

Blue-headed Vireo. *Vireo solitarius solitarius* (Wilson)

Observed regularly in small daily numbers (1 to 5) in the heavy forests about Joussard. Near Grimshaw one was noted on July 5, and on July 20 an adult was feeding young there.

Specimens:

Joussard: 2 ad. ♂; June 19 to 22, 1950

Grimshaw: 1 ad. ♂; July 5, 1950

Red-eyed Vireo. *Vireo olivaceus* (Linnaeus)

A fairly common breeding species, noted regularly in small numbers in wooded areas about both Joussard and Grimshaw.

Specimens:

Joussard: 3 ad. ♂; June 6, 1950

Grimshaw: 1 ad. ♂; July 8, 1950

[Philadelphia Vireo. *Vireo philadelphicus* (Cassin). At Hines Creek on July 18 the writer could identify only tentatively two vireos as of this species because of the thickness of the shrubbery in which they were fleetingly observed. Soper (1949) however, definitely identified one at Baptiste Lake on May 26, 1944, just east of our area.]

Western Warbling Vireo. *Vireo gilvus swainsonii* Baird

Fairly common in the Joussard and Grimshaw areas, daily numbers varying from 1 to 11.

Specimens:

Joussard: 3 ad. ♂; June 2 to 5, 1950

Grimshaw (2 to 16 miles north): 6 ad. ♂, 1 ad. ♀; July 4 to 20, 1950

Measurements of 9 males (in mm.): wing, 64.5-70.0 (av. 66.5); exposed culmen, 9.2-10.4 (9.8). In colour too they resemble *swainsonii*, except that the under parts appear to be slightly more whitish.

Black and White Warbler. *Mniotilta varia* (Linnaeus)

No more than three were seen in a day. It appeared commoner in the heavy forest about Joussard, than in the Grimshaw region. A female was seen carrying food at Joussard on June 19 and at Grimshaw on July 3.

Specimens:

Joussard: 2 ad. ♂; June 5-6, 1950
Grimshaw: 1 ad. ♂; July 1, 1950

Tennessee Warbler. *Vermivora peregrina* (Wilson)

Common in both the Joussard and Grimshaw areas where it was observed in daily numbers varying between one and ten. Near Grimshaw on July 27 one was feeding a large juvenal cowbird.

Specimens:

Joussard: 4 ad. ♂, 1 ad. ♀; June 3 to 17, 1950
Grimshaw: 3 ad. ♂, 1 ad. ♀, 1 ad. unsexed; July 1 to 20, 1950

Nashville Warbler. *Vermivora ruficapilla* subsp.

The only record seems to be that of Soper (1949) who observed several at Kimawan Lake on August 17 and 18, 1944.

Northern Yellow Warbler. *Dendroica petechia amnicola* Batchelder

A common breeding species observed in the Joussard area in daily numbers varying between four and thirty-one; in the Grimshaw area between one and seventeen daily. Breeding in both areas.

Specimens:

Joussard: 2 ad. ♂, 2 ad. ♀; June 3 to 6, 1950
Grimshaw: 2 ad. ♂, 3 ad. ♀; July 6, 1950

A male from Joussard (June 6) differs from the others in that it closely resembles *aestiva*.

Magnolia Warbler. *Dendroica magnolia* (Wilson)

Observed at High Prairie, May 28(1); at Joussard, June 2(1), 3(1), 4(1), 6(2), 12(1), 14(1), 15(1); and near Grimshaw, July 15(1). Preble (1908) says that eggs were collected in 1868 at Lesser Slave Lake and sent to the Smithsonian Institution.

Specimen:

Joussard: 1 ad. ♂; June 3, 1950

Cape May Warbler. *Dendroica tigrina* (Gmelin)

Noted near High Prairie, May 28(3); Joussard, June 5(1); and near Grimshaw, July 5(1), 27(1).

Specimen:

Grimshaw: 1 ad. ♂; July 5, 1950

Eastern Myrtle Warbler. *Dendroica coronata coronata* (Linnaeus)

Observed in small numbers mostly in mixed or coniferous forest in both the Joussard and Grimshaw areas. On July 7 at Grimshaw a female was seen feeding two juvenal cowbirds.

Specimens:

Joussard: 1 ad. ♂, 2 ad. ♀; June 6 to 7, 1950
Grimshaw: 5 ad. ♂, 3 ad. ♀; June 30 to July 24, 1950

Although Prairie Province populations have been referred to *hooveri* by Rand (1948) and Godfrey (1950), they are now considered closer to the nominate race by the writer (in press).

Black-throated Green Warbler. *Dendroica virens virens* (Gmelin)

Uncommon and local. Observed by us only in the vicinity of coniferous woods. In the Joussard area it was observed on June 3(1), 15(1), 20(4), and 22(1). Macoun and Macoun (1909) reported a pair at Peace River Landing, June, 1903. Soper (1949) saw it at Faust, Sturgeon Lake, and Kimawan Lake.

Specimens:

Joussard: 2 ad. ♂; June 3 to 15, 1950

Bay-breasted Warbler. *Dendroica castanea* (Wilson)

Apparently rare. We noted only one near Joussard on June 2. Soper (1949) recorded it near Faust and Sturgeon Lake.

Specimen:

Joussard: 1 ad. ♂; June 2, 1950

Black-polled Warbler. *Dendroica striata* (Forster)

Uncommon, singles and pairs being observed in both the Joussard and Grimshaw areas.

Specimens:

Joussard: 3 ad. ♂; 1 ad. ♀; June 7 to 22, 1950

Mackenzie Highway, Mile 55: 1 ad. ♂; July 8, 1950

Due to broad individual variation and consequent difficulties in correlating characters geographically, the writer is not, for the present at least, prepared to accept the proposed western race *D.s. lurida* Burleigh and Peters. Newfoundland adult males examined have, in average, slightly heavier and more extensive dorsal streaking, but alleged differences in other plumages are difficult to correlate geographically.

Gray Oven-bird. *Seiurus aurocapillus cinereus* Miller

Fairly common in deciduous woodland about both Joussard and Grimshaw.

Specimens:

Joussard: 3 ad. ♂, 1 ad. ♀; June 5 to 7, 1950

Dixonville: 1 imm. ♂; July 28, 1950

These, and birds from Lac la Nonne, average duller and greyer than specimens from more eastern localities.

Grinnell Waterthrush. *Seiurus noveboracensis notabilis* Ridgway

A few were noted in alder-willow tangles about Joussard, the southern part of the Mackenzie Highway, and at Hines Creek.

Specimen:

Hines Creek: 1 ad. ♀; July 18, 1950

Connecticut Warbler. *Oporornis agilis* (Wilson)

Observed sparingly in the Joussard and Grimshaw areas. Considerably less common than the following species about Joussard.

Specimen:

Grimshaw, 14 miles north: 1 ad. ♂; July 15, 1950

Mourning Warbler. *Oporornis philadelphia* (Wilson)

Fairly common about Joussard and the Lesser Slave Lake areas investigated and noted also at Sturgeon Lake. It was not observed by us in the Grimshaw area, however.

Specimens:

Joussard: 4 ad. ♂; June 12 to 15, 1950

Faust: 1 ad. ♂; June 19, 1950

Northern Plains Yellow-throat. *Geothlypis trichas campicola* Behle and Aldrich

About Joussard it was noted almost every day in daily numbers between one and twelve. It was decidedly less common about Grimshaw but was observed north to Whitemud River, July 21(4); and west to Hines Creek, July 18(1).

Specimens:

Joussard: 7 ad. ♂, 1 ad. ♀; June 7 to 21, 1950

Grimshaw (14 miles north): 1 ad. ♂; July 19, 1950

Canada Warbler. *Wilsonia canadensis* (Linnaeus)

Although not previously recorded from the region, the writer found this species inhabiting willow-alder tangles along streams near Joussard and Kinuso. One was observed also 16 miles north of Grimshaw on July 10.

Specimens:

Joussard: 2 ad. ♂; June 6 to 15, 1950

Northern Redstart. *Setophaga ruticilla tricolora* (Müller)

Breeds. Common about Joussard where daily numbers of observed individuals varied between three and thirty. Somewhat less numerous about Grimshaw.

Specimens:

Joussard: 3 ad. ♂, 1 sub-adult ♂; June 5 to 13, 1950

Grimshaw (16 miles north): 1 ad. ♀; July 10, 1950

Wetmore (1919) has shown that *tricolora* is a valid race.

English Sparrow. *Passer domesticus domesticus* (Linnaeus)

More or less common about settlement north to Manning. At High Prairie the species was observed on June 21 nesting in a grove of white spruce near the middle of the village. One tree had three nests and several others had two.

Western Meadowlark. *Sturnella neglecta neglecta* Audubon

Breeds. Singing males were observed at Driftpile on June 10(2), 16(1), and 19(1); at Peace River Village two adults on June 29; at Shaftsbury three singing males and two flying young on July 5; and also at Shaftsbury a total of nineteen adults and young on July 22; north of Dunvegan four were noted on July 18; one was seen on August 3 at Sexsmith. Our northernmost record is a juvenal near Dixonville on July 29. Soper (1949) observed this species in several localities, mostly south of Peace River.

Specimens:

Shaftsbury: 2 ad. ♀; July 22, 1950

Dixonville, 4 miles west: 1 juv. ♀; July 28, 1950

Yellow-headed Blackbird. *Xanthocephalus xanthocephalus* (Bonaparte)

We observed one at Grouard on June 8 and several at Clairmont Lake on August 4 and 5. Soper (1949) observed it also at Sturgeon, Ferguson, and Hermit Lakes. Preble (1908) stated that eggs from Lesser Slave Lake are recorded in the catalogue of the U.S. National Museum.

Giant Red-wing. *Agelaius phoeniceus arctolegus* Oberholser

Common breeding species in suitable habitat throughout the region. Earliest and latest nests with eggs, June 10 and July 17 respectively.

Specimens:

Joussard: 3 ad. ♂, 4 ad. ♀; June 7 to 9, 1950

High Prairie: 1 ad. ♂; 2 ad. ♀; June 23, 1950

Grimshaw (10-30 miles north): 2 ad. ♀; July 1 to 27, 1950

Baltimore Oriole. *Icterus galbula* (Linnaeus)

In the heavy deciduous forest about Joussard and Kinuso, this species was recorded daily in numbers between one and ten in a day. Although no nests were located, there can be little doubt, judging by the behaviour of several individuals, that the species breeds there. North of Peace River, about Grimshaw, it was apparently much scarcer. An adult male was observed at Cardinal Lake, July 3, and four near Shaftsbury on July 5.

Specimens:

Joussard: 1 ad. ♀; June 5, 1950

Kinuso (5 miles north): 1 ad. ♂; June 10, 1950

Shaftsbury: 1 ad. ♂; July 5, 1950

Rusty Blackbird. *Euphagus carolinus* (Müller)

Although we did not observe this species about Joussard, it was noted in the Grimshaw area as follows: July 3 (21, mostly young), 4(6), 5(4), 6(12), 11(16), 12(1), 13(6), 15(2), 21(12), 27(2), 31(6).

Specimens:

Grimshaw: 3 ad. ♂, 2 ad. ♀, 1 juv. ♂, 1 juv. ♀; July 3 to 5, 1950

Burleigh and Peters (1948) have separated the Newfoundland population, of which the writer has examined three adult males, two adult females, and one post-juvenal male. Since there is so much individual variation in this species and since the small Newfoundland samples are mostly in worn plumage, the writer is not yet prepared to express a decided opinion on the validity of *nigrans*.

Brewer Blackbird. *Euphagus cyanocephalus* (Wagler)

Observed almost daily in the Joussard area, as many as fourteen being recorded in a day. About Grimshaw it was seen daily and in larger numbers, but these larger numbers may have been due to so many young of the year then flying. Also five were noted 6 miles north of Hines Creek on July 18. A flock of about 100 adults and young in the valley of Meikle River at Mackenzie Highway on July 8 was our northernmost observation. Cowan (1939) did not record this species from the Peace River area of British Columbia.

Specimens:

Lesser Slave Lake (Driftpile and Kinuso): 1 ad. ♂, 1 ad. ♀; June 10 to 16, 1950

High Prairie: 1 ad. ♀; June 23, 1950

Grimshaw, 10 miles north: 1 ad. ♀; July 27, 1950

Hines Creek: 1 ad. ♂; July 18, 1950

Mackenzie Highway at Meikle River: 1 ad. ♂, 1 juv. ♂; July 8, 1950

Bronzed Grackle. *Quiscalus quiscula versicolor* Vieillot

Recorded in small numbers about Lesser Slave Lake (Faust, Joussard, Enilda, Grouard) in June. About Grimshaw its status was similar until

late July when as many as fifty were noted in a day. Observed also near Hines Creek on July 18, and a single was seen at Manning on July 7, our northernmost observation.

Specimen:

Grimshaw, 18 miles north: 1 ad. ♀; July 21, 1950

Nevada Cowbird. *Molothrus ater artemisiae* Grinnell

Common in both the Joussard and Grimshaw areas where noted almost daily in numbers between two and fifty-four. Young cowbirds were seen being fed near Grimshaw on July 4 by a Hermit Thrush and on July 7 by a Myrtle Warbler.

Specimens:

Joussard: 1 ad. ♀; June 8, 1950

High Prairie: 2 ad. ♂; June 23, 1950

Grimshaw: 2 ad. ♀; July 7 to 10, 1950

Western Tanager. *Piranga ludoviciana* (Wilson)

Breeds. Noted near Joussard, June 5(2), 7(1), 8(1), 9(3), 15(3), 16(4), 17(1), 19(3), 20(4), 22(2), August 5(1), 6(3); near Kinuso, June 10(2); 12 miles north of Grimshaw, July 3(1). Its breeding is indicated by the presence of an egg in the oviduct of a female taken at Joussard on June 8.

Specimens:

Joussard: 3 ad. ♂, 2 ad. ♀; June 7 to 20, 1950

Rose-breasted Grosbeak. *Pheucticus ludovicianus* (Linnaeus)

A fairly common breeding species. It was noted daily in the Joussard area in June in numbers between one and twelve per day. A nest (contents undetermined) was noted on June 5 at Joussard, and on June 6 a female was carrying material for another nest. In the Grimshaw area also this bird was frequently observed, seven being the largest number noted in any one day (July 3). Our northernmost observation was of one at Meikle River on July 8.

Specimens:

Joussard: 2 ad. ♂, 3 sub-ad. ♂, 1 ad. ♀; June 3 to 14, 1950

Grimshaw: 1 ad. ♂, 3 ad. ♀; July 1 to 11, 1950

Evening Grosbeak. *Hesperiphona vespertina* subsp.

Macoun and Macoun (1909) state that Spreadborough saw two between Lesser Slave Lake and Peace River Landing in June and a pair with young birds just able to fly at Dunvegan on July 26, 1903. A single male at Joussard on June 6 was our only observation.

Taverner Purple Finch. *Carpodacus purpureus taverneri* Rand

Observed about Joussard in daily numbers varying between one and nineteen and in the Grimshaw area in daily numbers between one and ten. Noted north to Meikle River where two were seen on July 8.

Specimens:

Joussard: 2 ad. ♂, 1 ad. ♀, 1 sub-ad. ♂; June 2 to 19, 1950

Grimshaw: 10 ad. ♂, 4 ad. ♀; July 1 to 10, 1950

From this series of eighteen it is apparent that *taverneri* is a perfectly valid race.

Northern Pine Siskin. *Spinus pinus pinus* (Wilson)

Noted in small numbers almost daily in both the Joussard and Grimshaw areas.

Specimens:

Joussard: 1 ad. ♂; June 7, 1950

Grimshaw: 3 ad. ♀; June 30 to July 13, 1950

Goldfinch. *Spinus tristis* subsp.

Our only observation is of one seen by MacDonald at Joussard. Soper (1949) too found it rare but recorded it from Lesser Slave Lake, Peace River village, and near Grimshaw. Williams (1933) observed that this species was common in song at Peace River village on May 8, 1922.

Red Crossbill. *Loxia curvirostra* subsp.

This species, not previously recorded from the region, was observed in 1950 on four occasions. On July 6, five were recorded near Grimshaw and twenty-eight on July 28; on July 11, four were seen 16 miles north of Grimshaw; and on August 7 at Joussard a flock of twenty-two was closely observed. During June this species was not observed in the Joussard area. Unfortunately, there was no opportunity to collect specimens, and the subspecies involved is therefore not known.

White-winged Crossbill. *Loxia leucoptera leucoptera* Gmelin

This species, not previously recorded from the region, was observed in the Joussard area on June 3(5), 22(2), 25(4); near High Prairie, June 21(1); Grimshaw area, July 4(7), 5(4), 6(2), 11(11), 13(8), 15(22), 17(5), 19(2), 28(2); Sturgeon Lake, August 5(2).

Specimens:

Grimshaw (16 miles north): 3 ad. ♂, 1 sub-ad. ♂, 1 ad. ♀; July 15, 1950

Nevada Savannah Sparrow. *Passerculus sandwichensis nevadensis* Grinnell

A common breeding species in suitable habitat throughout the region.

Specimens:

Joussard and Kinuso: 5 ad. ♂, 2 ad. ♀; June 8 to 13, 1950

High Prairie: 2 ad. ♂, 1 ad. ♀; June 21, 1950

Grimshaw and Browndale: 1 ad. ♂, 1 ad. ♀, 1 juv. ♂; July 4 to 18, 1950

Mackenzie Highway at Meikle River: 1 ad. ♀; July 8, 1950

LeConte Sparrow. *Passerherbulus caudacutus* (Latham)

This species was found to be locally fairly common in both the Joussard and Grimshaw areas, occupying drier edges of moist meadows and marshes where rank growths of sedges and grasses are interspersed with willow and alder. In the writer's experience it prefers a drier habitat than the following species. It was noted about Joussard on June 7(8), 8(10), 9(1), 13(3), 14(5), 15(3), 17(1), 20(3), 21(5), 22(1), 23(4), 24(4), August 6(3). Kinuso, June 16(2); Faust, June 10(3); between Grimshaw and Dixonville on June 28(3), July 1(4), 3(3), 4(5), 5(2), 10(4), 11(5), 12(4), 13(2), 15(1), 16(1), 17(2), 19(2), 20(9), 21(32, Whitemud River), 22(10), 23(4), 25(5), 26(3), 27(5), 28(21), 29(7), 30(2). A female taken near Joussard on June 14 was in laying condition.

Specimens:

Joussard: 6 ad. ♂, 2 ad. ♀; June 7 to 15, 1950

Grimshaw: 4 ad. ♂, 1 ad. ♀; July 1 to 27, 1950

Nelson Sparrow. *Ammospiza caudacuta nelsoni* (Allen)

As Soper (1949) says, this is a rare sparrow in the region. At Joussard it was observed but once, a singing male on June 8. Three were noted near Fairview on July 18; three at Cardinal Lake, July 20, and three others at the same lake on July 22. Near Dixonville on July 29 two were seen. It appears to prefer wetter parts of marshy places than the preceding species, often frequenting the cat-tails or bulrushes at the water edge. Spreadborough (Macoun and Macoun, 1909) saw a few in a marsh at Peace River village in June, 1903, and saw another west of Grande Prairie.

Specimens:

Cardinal Lake: 2 ad. ♂; July 20, 1950
Peace River Landing: 1 ad. ♂; June 20, 1903 (Spreadborough)

Western Vesper Sparrow. *Pooecetes gramineus confinus* Baird

Small numbers in more open areas in the Lesser Slave Lake region (Joussard, Faust, Kinuso, Grouard), more common in the farming country about High Prairie. Between McLennan and the northern limits of agriculture near Meikle River at the Mackenzie Highway, this bird was common, as many as fifty-three being counted in a day. On July 1 flying young were first noted near Grimshaw. On July 6 a number of young were out of the nest, although on the following day a nest with four eggs was located.

Specimens:

High Prairie: 3 ad. ♂, 2 ad. ♀; June 21, 1950
Grimshaw: 3 ad. ♂; July 1 to 10, 1950

They average slightly, but probably not significantly, darker above than birds from southern Alberta and Saskatchewan.

Slate-colored Junco. *Junco hyemalis hyemalis* ← → *cismontanus*

Observed almost daily throughout the region but no more than sixteen were recorded on any one day. Two families of flying young noted June 19, and latest nest noted was on July 3 when this contained five eggs.

Specimens:

Joussard: 4 ad. ♂, 1 ad. ♀; June 7 to 23, 1950
Grimshaw: 3 ad. ♂, 2 ad. ♀; July 6 to 8, 1950

These specimens are perplexingly intermediate but in average are probably nearer the nominate race.

Tree Sparrow. *Spizella arborea* subsp.

Macoun and Macoun (1909) stated that Spreadborough noted "a few" at Lesser Slave Lake, and one individual at Peace River Landing in June, 1903. Presumably it is a more or less common migrant in the region, but the periods Soper (1949) and we spent in the region apparently did not include its normal migration seasons, for we did not record it.

Chipping Sparrow. *Spizella passerina passerina* ← → *arizonae*

Regularly noted in small numbers, breeding in both the Joussard and Grimshaw areas. Noted west to Hines Creek and north to Meikle River.

Specimens:

Joussard: 3 ad. ♂, 1 ad. ♀; June 6 to 19, 1950
Grimshaw: 1 ad. ♂, 2 ad. ♀; June 30 to July 4, 1950

As the writer (1950) has pointed out, there is a most unsatisfactory understanding of the racial status of the chipping sparrows of north-western North America. The writer refrains from making such a study in the understanding that the situation will eventually be clarified in a forthcoming publication by another ornithologist.

Clay-colored Sparrow. *Spizella pallida* (Swainson)

Noted daily in small numbers. Northernmost observation was at Meikle River at Mackenzie Highway. A nest near Grimshaw on July 6 contained four eggs.

Specimens:

Joussard: 6 ad. ♂; June 2 to 21, 1950

High Prairie: 2 ad. ♂; June 23, 1950

Grimshaw: 8 ad. ♂, 1 juv. ♀; July 1 to 11, 1950

Gambel Sparrow. *Zonotrichia leucophrys gambelii* (Nuttall)

Observed near Peace River Village on June 30(3) and July 25(2); near Reno, June 27(3); Mackenzie Highway between Grimshaw and Dixonville, July 1(4), 6(1), 7(1), 8(1). Not noted near Lesser Slave Lake. Williams (1933) stated that it was common in song at Peace River village on May 8, 1922, and Soper (1949) saw singing males southwest of our areas.

Specimen:

Grimshaw, 18 miles north: 1 ad. ♂; July 1, 1950

White-throated Sparrow. *Zonotrichia albicollis* (Gmelin)

In both the Joussard and Grimshaw areas this was a common breeding species. It was noted north to Keg River and west to Hines Creek, respectively the northernmost and westernmost points covered in the present investigation.

Specimens:

Joussard: 3 ad. ♂; June 5 to 8, 1950

Grimshaw: 2 ad. ♂, 1 ad. ♀; July 1 to 7, 1950

Alaska Fox Sparrow. *Passerella iliaca zaboria* Oberholser

Singing males were noted at High Prairie, Faust, Kinuso, and Joussard in June. Single birds were seen near Dixonville, Flood Lake, Cardinal Lake, and Fairview.

Specimens:

Joussard: 2 ad. ♂; June 15 to 20, 1950

Peace River Landing: 3 ad. ♂; June 14 to 24, 1903 (Spreadborough)

This lightly marked race is barely distinguishable by its slightly less rufescent dorsal coloration as compared with that of *iliaca* from the east side of James Bay and eastward.

Lincoln Sparrow. *Melospiza lincolnii lincolnii* (Audubon)

This breeding species was observed regularly but in small numbers near Joussard and Kinuso. It was perhaps slightly commoner in the Grimshaw area. Our northernmost observations were along the Mackenzie Highway at Meikle River where there were three on July 8, and at Mile 110 where one was noted on July 24.

Specimens:

Joussard: 4 ad. ♂; June 5 to 20, 1950

Grimshaw: 3 ad. ♂, 2 ad. ♀; June 30 to July 27, 1950

Northern Swamp Sparrow. *Melospiza georgiana ericrypta* Oberholser

This species which breeds in the region was noted on the south side of Lesser Slave Lake on June 3(1), 7(6), 8(7), 9(1), 10(2), 13(2), 14(3), 15(4), 20(3), 21(2), 23(2), 24(2). In the Grimshaw area we recorded it on June 30(4); July 1(2), 4(2), 10(1), 12(1), 19(2), 20(2), 21(1), 29(1 carrying food). Our northernmost observation was along the Mackenzie Highway at Whitemud River, July 24(1).

Specimens:

Joussard: 2 ad. ♂; June 7, 1950

Grimshaw, 16 miles north: 1 ad. ♂; July 19, 1950

Dakota Song Sparrow. *Melospiza melodia juddi* Bishop

Recorded almost daily in both the Joussard and Grimshaw areas in numbers between one and twelve per day. It appeared to be slightly less common in the Grimshaw area but was noted west to Hines Creek. Soper (1949) noted it west to Ray Lake, Alberta, but Cowan (1939) found no evidence of its occurrence in the British Columbia part of the Peace River country.

Specimens:

Joussard: 4 ad. ♂, 4 ad. ♀; June 8 to 20, 1950

Peace River Landing: 1 ad. ♂; June 26, 1903 (Spreadborough)

[McCown Longspur. *Rhynchophanes mccownii* (Lawrence). Macoun and Macoun (1909) mention one seen by Spreadborough on an island in Lesser Slave Lake on May 31, 1903. Since the locality is so far north of the known range of the species, this sight record seems best placed in the hypothetical list.]

Smith Longspur. *Calcarius pictus* (Swainson)

Macoun and Macoun (1909) state that Spreadborough saw a few at Egg Lake, Peace River, lat. 56° on August 30, and others at Lesser Slave Lake, September 5, 1903.

LITERATURE CITED

- Baird, S. F., T. M. Brewer, and R. Ridgway (1874): A history of North American birds, land birds. Vol. 2, pp. 1-590, pls. XXVII-LVI.
- Baker, Bernard W., and Lawrence H. Walkinshaw (1946): Bird notes from Fawcett, Alberta. Canadian Field-Nat., vol. 60, No. 1, pp. 5-10.
- Bent, Arthur Cleveland (1932): Life histories of North American Gallinaceous Birds. U.S. Nat. Mus., Bull. 162, pp. 1-490.
- (1942): Life histories of North American Flycatchers, Larks. U.S. Nat. Mus., Bull. 179, pp. 1-555.
- Burleigh, Thomas D., and Harold S. Peters (1948): Geographical variation in Newfoundland birds. Proc., Biol. Soc. Washington, vol. 61, pp. 111-124.
- Cowan, Ian McTaggart (1939): The vertebrate fauna of the Peace River district of British Columbia. Brit. Columbia Prov. Mus., Occas. Papers, No. 1, pp. 1-102.
- Eaton, Stephen W. (1948): Bird distribution along the Peace, Slave, and Little Buffalo Rivers of Canada. The Auk, vol. 65, No. 3, pp. 345-352.
- Farley, Frank L. (1917): Birds observed at Grande Prairie City, Peace River district. Ottawa Naturalist, vol. 30, No. 11, pp. 157-158.
- Godfrey, W. Earl (1950): Birds of the Cypress Hills and Flotten Lake Regions, Saskatchewan. Nat. Mus., Canada, Bull. 120, pp. 1-96.
- (1951): Geographical variation in the Boreal Chickadee East of the Rockies. Can. Field-Nat., vol. 65, No. 1, pp. 22-26.
- Henderson, A. D. (1923): Nesting of the Solitary Sandpiper. The Oologist, vol. 40, No. 4, pp. 53-56.

- Lloyd, Hoyes (1922): A recent breeding record of the Trumpeter Swan in Alberta. *Can. Field-Nat.*, vol. 36, No. 8, pp. 143-144.
- Macoun, James M. (1904): Report on the Peace River region. *Geol. Surv., Canada*, No. 855, pp. 5E-48E.
- Macoun, John, and James M. Macoun (1909): Catalogue of Canadian birds. *Dept. of Mines, Geol. Surv. Branch*, No. 973, pp. 1-761.
- Preble, Edward A. (1908): A biological investigation of the Athabaska-Mackenzie region. *North American Fauna*, No. 27, pp. 1-574.
- Rand, A. L. (1944): Birds of the Alaska Highway in British Columbia. *Can. Field-Nat.*, vol. 58, No. 4, pp. 111-125.
- (1946): List of Yukon birds and those of the Canol Road. *Nat. Mus., Canada*, Bull. 105, pp. 1-76.
- (1948): Birds of Southern Alberta. *Nat. Mus., Canada*, Bull. 111, pp. 1-105.
- Randall, T. E. (1933): A list of the breeding birds of the Athabasca district, Alberta. *Can. Field-Nat.*, vol. 47, No. 1, pp. 1-6.
- Raup, Hugh M. (1934): Phytogeographic studies in the Peace and Upper Liard River regions, Canada, with a catalogue of the vascular plants. *Contrib. Arnold Arboretum of Harvard Univ.*, No. 6, pp. 1-230, 9 pls., 1 map.
- Ridgway, Robert (1904): The birds of North and Middle America. *U.S. Nat. Mus.*, Bull. 50, pt. 3, pp. 1-801.
- (1907): The birds of North and Middle America. *U.S. Nat. Mus.*, Bull. 50, pt. 4, pp. 1-973.
- Soper, J. Dewey (1942): The birds of Wood Buffalo Park and vicinity, Northern Alberta and District of Mackenzie, N.W.T., Canada. *Trans. Royal Can. Inst.*, vol. 24, No. 51, pt. 1, pp. 19-97.
- (1949): Birds observed in the Grande Prairie-Peace River Region of North-western Alberta, Canada. *The Auk*, vol. 66, No. 3, pp. 233-257.
- Sutton, George Miksch (1935): A new Blue Jay from the western border of the Great Basin. *The Auk*, vol. 52, No. 2, pp. 176-177.
- Williams, M. Y. (1922): Biological notes along the fourteen hundred miles of the Mackenzie River system. *Can. Field-Nat.*, vol. 36, No. 4, pp. 61-66.
- (1933): Biological notes, covering parts of the Peace, Liard, Mackenzie, and Great Bear River basins. *Can. Field-Nat.*, vol. 47, No. 2, pp. 23-31.
- Wetmore, Alexander (1949): Geographical variation in the American Redstart (*Setophaga ruticilla*). *Journ. Washington Acad. Sciences*, vol. 39, No. 4, pp. 137-139.

NOTES ON MAMMALS OF YUKON

By Austin W. Cameron

A faunal survey of southern Yukon was made in the summer of 1949 by W. Earl Godfrey, assisted by Messrs. Colin Thacker, Ian V. F. Allen, and C. Waterston. Although the objective of the expedition was primarily ornithological, a fine series of mammals was secured, and a considerable volume of information concerning the native mammalia was obtained by Mr. Allen. The present paper is a report on the taxonomy of this collection with annotations regarding numerical status, distribution, and other pertinent data drawn from notes maintained by the field collectors.

ITINERARY

Camp 1: located in the Shaskwak Valley at the base of the St. Elias Range and at the south end of Kluane Lake. While located at this camp, the area west and south of Kluane Lake north to Burwash Landing was investigated, and a two-day trip was made to White and Donjek Rivers region. June 25 to July 15.

Camp 2: located on the Haines Road at Kathleen River. From this camp the area from Haines Junction south to the Yukon-British Columbia border was investigated. July 16 to August 5.

Camp 3: located at Carcross from which the area east to Tagish and north to Whitehorse was investigated. August 6 to 23.

AREAS VISITED

Kluane Lake: Kluane Lake lies east of the St. Elias Range in extreme southeastern Yukon. The mountain range acts as a barrier to moisture-laden winds; hence the Kluane region is an area of light precipitation. As would be expected, there is considerable variation in the composition of the vegetative zones at the various altitudinal levels. Forest trees attain their greatest development in the valleys, although certain species extend for some distance up the mountain slopes. White spruce (*Picea glauca*) is the most abundant species, with balsam poplar (*Populus balsamifera*) considerably less common. Willows cover the recent burns, while silverberry (*Eleagnus argentea*) and certain species of grasses occur on the river flats.

Kathleen River: The Kathleen River area lies closer geographically to the humid Pacific coastal region than does Kluane Lake or Carcross; hence the vegetation is more luxuriant and of somewhat different composition. Whereas the trembling aspen (*Populus tremuloides*) is almost totally absent in the aforementioned areas, it occurs commonly in the area under consideration. Here a number of plants, notably a species of horsetail (*Equisetum* sp.) and cow parsnip (*Heracleum lanatum*), reach better development than in the other areas investigated. It is in this region and in the areas to the southwest that the Pacific Coast influence is most evident in the mammals.

Carcross Region: Because it is shielded from the moisture-laden winds from the Pacific Ocean by the northern extension of the Coast Mountains, the Carcross area is more arid than the Kathleen River and Kluane Lake areas, and the vegetation differs accordingly. Some areas are of prairie-like aspect with buffalo-berry (*Shepherdia canadensis*) occurring on the dryer slopes, and willow and alder predominating along the water courses. Lodgepole pine occurs commonly in contrast to the other two areas.

THE MAMMAL FAUNA

Southwestern Yukon is of especial mammalogical interest, because it is a common meeting ground for species whose main centre of abundance is (1) south-central Canada, (2) central Alaska, and (3) the humid coast of Alaska. In addition, the wide range of habitats created by the mountainous terrain with intermontane lowlands of radically different ecological characteristics provide suitable habitats for a wide selection of species with diverse ecological predilections. In the valley bottoms, conditions are favourable for species of more southern distribution, while the alpine meadows and similar mountain habitats possess a mammal fauna of more northern nature. In the lowlands the typical species are moose, porcupines, meadow voles, and meadow jumping mice. Above timberline, lemmings, tundra voles, and mountain sheep are characteristic species. In the prairie-like areas ground squirrels and chipmunks occur, while black bears and grizzlies are found in a variety of habitats.

Of the fifty-two terrestrial species recorded for Yukon, the woodchuck, chipmunk, wood rat, phenacomys vole, and meadow jumping mouse are mammals that occur in southern Canada east of the mountains and reach their northwesternmost distribution in Yukon and Alaska. Certain forms of the humid southeastern Alaska region, such as the mountain water shrew, St. Elias red squirrel, and northwestern coast beaver occur in extreme southwestern Yukon. Central Alaska forms that extend their ranges at least as far east as Yukon include the tundra shrew, Arctic shrew, Alaska red fox, Yukon Valley timber wolf, Yukon otter, northern hoary marmot, Yukon flying squirrel, Alaska brown lemming, Alaska collared lemming, and Alaska moose. The Dawson red-backed mouse might also logically be placed in the last-mentioned category in view of the fact that it is obviously a relatively recent emigrant from Asia across the Bering Strait, although it now occurs east to Keewatin District.

Because of the sparseness of human settlement in the Yukon, the habitats of the native mammals have not suffered the alteration or destruction that has occurred in most parts of southern Canada. As a result we find that the mammalian fauna is essentially like that of the early days when the white man first entered the territory. As might be expected, the big game mammals and fur-bearers suffered most heavily in the early days and even to-day a large part of the population depends upon these resources for their livelihood. The smaller mammals have been affected to a lesser degree, although the occurrence of widespread burns and the subsequent sub-climax vegetation provides suitable habitat for many species that probably were rather uncommon formerly. The construction of the Alaska Highway has also provided an avenue of ingress consisting of areas of sub-climax vegetation. A few species are believed to have

entered the territory within historic time. The moose was first observed in 1910, and there are unsubstantiated reports that the mule deer occurs in southern valleys.

PREVIOUS WORK IN THE AREA

A number of mammalogical investigations have been conducted in Yukon Territory, notably those made by W. W. Osgood, C. Sheldon, and A. L. Rand. Osgood (1900) made a survey of the Yukon River region in 1899 and published an annotated list in *North American Fauna* No. 19. In 1904 he worked the MacMillan River region and published his results in *North American Fauna Series* No. 30 (1909). Sheldon (1911) in 1905 made a trip up Ross River in search of sheep, and his mammalogical observations appeared in his book "The Wilderness of the Upper Yukon." In 1944 Rand studied the mammals on the Canol Road in the Yukon and published his results in a bulletin of the National Museum of Canada (1945). Other mammal lists have been published by Williams (1925), Elton (1935), Clarke (1946), Bond (1948), and Judd (1950). Rand has compiled an excellent account of all the information concerning Yukon mammals that appeared up to 1944 in his *Mammals of Yukon, Canada* (1945).

SYSTEMATIC LIST

Cinereous Shrew. *Sorex cinereus cinereus* Kerr

One of the commoner small mammals in wooded sections of southern Yukon. Its habitat preferences are essentially like those of members of the species in more southern parts of Canada. One specimen taken July 2 at the head of Kluane Lake was secured in a spruce grove with a forest litter of decaying vegetation, fallen logs, and moss. Another taken at Kluane Lake on July 11 was trapped in the moss among willows bordering a glacial stream. Two other specimens were taken in moss bordering a glacial stream on July 15 at Carcross where a specimen of the Mountain Shrew (*Sorex palustris navigator*) was secured.

Specimens collected:

Head of Kluane Lake:	July 11; 1 female
Kathleen River:	July 21; 1 male
	July 23; 1 male
	July 23; 1 female
	July 27; 1 male
	July 27; 1 female

Measurements (in mm.):

3 males:	L, 91 (90-93); T, 33.2 (33-35); HF, 12 (11-13)
3 females:	L, 95.6 (91-101); T, 37.8 (37-38); HF, 11.6 (11-12)

Mountain Water Shrew. *Sorex palustris navigator* (Baird)

The single specimen taken at Carcross on August 15 by Allen is the second record for Yukon. The collector describes the habitat as "... a spruce forest dotted occasionally with open glades (sandy dunes covered with grass). The underbrush is mainly willow, alder, and some aspen with buffalo-berry very common and in some spots it occurs as the only undergrowth." The specimen was taken in "... a trap set in the moss that bordered one of swift glacial streams that flows through a grassy glade." The specimen, a male, measures: L, 153; T, 76; HF, 19.

Little Brown Bat. *Myotis lucifugus lucifugus* (LeConte)

A male specimen collected by Waterston on July 30 at Kathleen River measures (in mm.): L, 94; T, 38; HF, 12. A bat seen flying along a wooded road in the same locality may have been this species.

Black Bear. *Euarctos americanus* subsp.

This bear was not uncommon in the areas visited by the party. On July 26 one was seen at Mile 135 and a female with cubs at Mile 118. On two occasions bears were observed feeding on horsetail (*Equisetum* sp.), once on July 27 at Dezadeash Lake and again on July 29 at Kathleen River. On the latter occasion the animal was so preoccupied in this activity that it permitted Godfrey to approach within a few yards. Frequently it sat on its haunches and grazed the surrounding area before moving on to another site. Tracks were also observed at the following localities: Head of Kluane Lake, July 1; Donjek River, July 4; Slims River, July 7; Sulphur Lake, July 9; Mile 972, Alaska Highway, July 22.

Grizzly Bear. *Ursus* sp.

Local residents informed the party that this species is not uncommon in southwestern Yukon. An adult visited the camp's garbage dump at Kathleen River on July 24, and a dead cub was located in a small creek at Kluane Lake on July 13. Tracks were observed at the following localities: Kluane Lake, June 27; Silver Creek, July 1; Carcross, August 18.

Short-tailed Weasel. *Mustela erminea richardsoni* Bonaparte

Not uncommon in the areas worked by the field party. On one occasion at Mile 113 on the Haines Road, Godfrey called up four weasels by imitating the squeak of a mouse. One specimen was taken in an ordinary mouse trap baited with oatmeal, raisins, and bacon fat; another was captured in an empty vinegar keg in the cabin of Mr. Rupert Chambers, Warden of Kluane Sanctuary.

Specimens collected:

Head of Kluane Lake: July 30; 1 female
July 2; 1 male
July 4; 1 male

Haines Road: July 4, 1 male
July 23; 4 males

Measurements (in mm.):

3 males: L, 311 (281-331); T, 86.3 (80-91); HF, 45.7 (42-48)
1 female: L, 280; T, 82; HF, 34

American Wolverine. *Gulo luscus luscus* (Linnaeus)

Mr. Rupert Chambers, Warden of Kluane Park, kindly donated a female specimen to the National Collection. A local trapper reported that he took six wolverine at Blanchard River in extreme southwestern Yukon during the winter of 1948-49.

Red Fox. *Vulpes fulva* subsp.

Local trappers report that this fox is fairly common in southern Yukon. One was observed on August 12 at Kathleen River.

Coyote. *Canis latrans incolatus* Hall

Apparently rather uncommon in Yukon. One was collected at White River near the Yukon-Alaska boundary on July 4. The remains of a dead animal were observed at Kluane Lake on July 12, and tracks were noted at the head of the Lake on several occasions.

Timber Wolf. *Canus lupus* subsp.

Local residents reported that this species is not uncommon. The field party observed tracks at the head of Kluane Lake on June 27 and at Sulphur Lake on July 9.

Hoary Marmot. *Marmota caligata* subsp.

This inhabitant of the hills above timberline was frequently heard, especially near Slims River. One specimen was collected by Godfrey near the mouth of Slims River on July 14 at a much lower altitude than is normal for this species. This specimen, a female, measures: L, 649; T, 178; HF, 91. Another specimen from Slims River was donated to the National Collection by Mr. Rupert Chambers, Warden of Kluane Sanctuary. These two specimens are paler than material from eastern Yukon and may be referable to *oxytona*, but it seems unwise to refer them to this form until additional comparable material is available.

Yukon Ground Squirrel. *Citellus parryii plesius* (Osgood)

The most conspicuous mammal in southern Yukon; Godfrey counted thirty-seven at one time at Kluane Lake on July 11. Their high-pitched bird-like calls were familiar sounds in the parklands and above timberline. At Kluane Lake they were observed perched as high as 10 feet above the ground on log piles. Their burrows were conspicuous, and in many instances there was evidence of grizzly bears digging the animals out. Considerable variation with regard to the amount of ventral reddish coloration was noted among members of different families.

Specimens collected:

Head of Kluane Lake:	June 26; 1 female
	June 29; 1 male
	June 30; 1 male
Kathleen River:	July 23; 1 male
	July 23; 1 male

Measurements:

4 males: L, 343 (335-352); T, 98 (89-107); HF, 54 (53-55).
1 female: L, 333; T, 93; HF, 44.

Yukon Chipmunk. *Eutamias minimus caniceps* Osgood

Fairly common in the areas investigated by the field party with the largest number observed by Godfrey in the aspen woodlands at Haines Junction. Although rather widely distributed in a variety of habitats, it does not occur in the bogs or above timberline. Two specimens were taken along a telephone line, cut through a rather dry upland spruce-aspen forest. This species was frequently seen on the edges of the prairie-like grassy areas in Carcross area.

Specimens collected:

Head of Kluane Lake:	June 30; 2 females
	July 1; 1 female
	July 12; 1 male
Carcross:	August 21; 1 male
	August 22; 1 male

Measurements:

3 males: L, 196 (178-206); T, 82.3 (69-93); HF, 32.8 (32-33)
3 females: L, 212.8 (212-213); 95 (93-98); HF, 30.8 (30-31)

St. Elias Red Squirrel. *Tamiasciurus hudsonicus petulans* Osgood

One of the most abundant and conspicuous mammals in the wooded valleys of southwestern Yukon. This species was commonly seen near vacated construction camps where they had taken up residence, and occasionally they were observed in company with ground squirrels. In several instances it appeared that the two species were occupying adjacent burrows. In addition to those collected, red squirrels were observed at Kluane Lake, June 27; Slims River, July 7; Head of Kluane Lake, July 12; Kathleen River, July 17, July 22; and Alaska Highway Mile 972, July 23.

Specimens collected:

Kluane Lake: June 25; 1 female
 June 26; 1 male
 July 3; 1 female
 July 8; 1 female
 July 12; 1 male
 Slims River: July 7; 1 female
 Kathleen River: July 17; 1 female
 July 19; 1 female
 July 20; 1 female
 July 23; 2 females

Measurements:

2 males: L, 330, 323; T, 120, 120; HF, 48, 50

9 females: L, 316.1 (290-330); T, 117.7 (111-125); HF, 47.7 (42-52)

Compared with six May specimens of *T. h. petulans* from Chikina Glacier, Alaska, the above specimens average slightly paler dorsally, in this respect approaching *T. s. columbiensis*. The zone of intergradation between *petulans* and *columbiensis* evidently is quite narrow, as specimens from Teslin Lake and Nisutlin River are considerably paler than the present series and are clearly referable to *columbiensis*.

Yukon Flying Squirrel. *Glaucomys sabrinus yukonensis* Osgood

The three specimens secured were taken in the same spot at Kathleen River. In this area the forest consists of mature spruce and aspen, and the vegetation in general is more luxuriant than elsewhere in southwestern Yukon. The traps were set on a heap of spruce cone scales at the base of a tall spruce. The usual oatmeal, raisins, and bacon fat bait was used in one case, and meat bait in the other two instances. Although this species is said to be not uncommon in southern Yukon, very few specimens have been taken by scientific collectors.

Measurements:

1 male: L, 307; T, 142; HF, 41

2 females: 331, 339; T, 148, 158; HF, 41, 45

Although referable to *G. s. yukonensis*, the above specimens average smaller, are somewhat greyer dorsally, and have a slightly darker tail, showing in these respects a tendency to *G. s. alpinus*.

Deer Mouse. *Peromyscus maniculatus algidus* Osgood

One of the most abundant small mammals in southern Yukon. It seems to occur in almost every type of habitat in the forested areas. Most of the specimens taken by the 1949 field party were secured in relatively dry open woods with an understory of such species as wild sunflower, bunchberry, willow, and various grasses. Traps set along fallen logs, and under windfalls were particularly productive.

Specimens collected:

Kluane Lake: June 26; 1 female
 June 27; 1 male
 July 8; 1 female
 July 9; 1 male
 July 10; 1 male
 July 11; 1 male
 Kathleen River: July 16; 1 male, 2 females
 July 18; 1 male
 July 19; 1 male, 1 female
 July 20; 2 males, 1 female
 July 21; 1 male
 Carcross: August 18; 1 female
 August 22; 7 males, 3 females

Measurements:

14 adult males: L, 169.7 (160-187); T, 82.5 (70-90); HF, 21.4 (20-23)
 11 adult females: L, 194.9 (162-191); T, 83.8 (73-95); HF, 21.3 (20-23)

The present series are paler (less dusky), average slightly larger, and have larger molars than specimens of *P. m. borealis* from northern Alberta, and therefore seem referable to *P. m. algidus*.

Dawson Red-backed Mouse. *Clethrionomys dawsoni dawsoni* Merriam

Not uncommon in southwestern Yukon. Although there is insufficient evidence, it appears that this species is more frequently found on drier uplands than is the Gapper Red-backed Mouse (*Clethrionomys gapperi*). The habitat in which two specimens were taken at Carcross seems fairly typical of the species in the Yukon region: ". . . the spruce forest is interspersed here and there with groves of aspen with an understory of willow, alder, and buffalo-berry. Small clearings in the forest are heavily vegetated with a species of wild grass. Traps were set among the brush on the edges of these grassy clearings."

Specimens collected:

Kluane Lake: June 30; 1 male
 Kathleen River: July 19; 1 female
 July 22; 2 males
 July 26; 1 female
 Carcross: August 15; 1 female
 August 16; 1 female

Measurements:

3 males: L, 126 (124-128); T, 30.3 (25-33); HF, 18.3 (16-20)
 4 females: L, 138 (128-149); T, 33.2 (30-38); HF, 18.5 (18-20)

Meadow Vole. *Microtus pennsylvanicus drummondi* (Audubon and Bachman)

Apparently rather uncommon in 1949. This species in Yukon is restricted largely to the valley bottoms in meadows along river and lake borders. Two were taken at the edge of a spruce bog at Donjek River on July 10. Several secured at Kluane Lake were trapped among grass and willow at the edge of a sandy beach.

Specimens collected:

Donjek River: July 4; 2 males
 Kluane Lake: July 7; 1 male
 July 8; 1 male
 July 9; 1 male

Measurements:

5 males: L, 140.6 (125-154); T, 34 (27-35); HF, 18 (17-19)

Macfarlane's Tundra Vole. *Microtus operarius macfarlanei* Merriam

This is the *Microtus* of the tundra and alpine meadows. Numerous runways were noted in the tundra on the Kluane Mountains near the head of Kluane Lake.

Specimens collected:

Kluane Lake: June 25; 1 male
 June 26; 1 male, 1 female
 Donjek River: July 4; 1 female

Measurements:

2 males: L, 135, 161; T, 30, 38; HF, 17, 15
 2 females: L, 142, 151; T, 37, 29; HF, 18, 19

Muskrat. *Ondatra zibethica* subsp.

A skull was picked up at Crag Lake on August 18 by Thacker. The scarcity of suitable habitat is evidently responsible for the paucity of muskrats.

Snowshoe Hare. *Lepus americanus macfarlanei* Merriam

In 1949 the snowshoe hare was evidently at a low in its cycle of abundance as very few were observed, although numerous "rabbit trails" were observed. Several of these animals were observed at the head of Kluane Lake on June 27, and one was seen at Sulphur Lake on July 9. One specimen was collected at Kluane Lake on July 5. It measured: L, 462; T, 38; HF, 139.

Moose. *Alces americana* subsp.

On July 25 Thacker and Allen observed a large bull moose in a mixed spruce-willow-aspen forest almost at timberline at Mile 85 on the Haines Road just north of the British Columbia-Yukon boundary. Godfrey observed moose tracks on the flats of the Slims River on June 27, and numerous tracks and scats were seen on the Alaska Highway, Mile 972, on July 22. Evidently moose were fairly abundant in the area. Local residents reported that the moose is not uncommon and that the first animals were seen in the area about 1910.

Dall Sheep. *Ovis dalli* subsp.

This species was observed on several occasions on the slopes of the Kluane Mountains, west of Kluane Lake. On June 25 seven were seen in a draw above the Shakwak Valley. Two were encountered along the Haines Road at Mile 131 on August 1 by Godfrey and Thacker. Tracks and scats were noted in an alpine meadow on Kluane Mountain on July 1 and in a river flat of the Slims River on July 2. All those observed were pure white.

BIBLIOGRAPHY

- Anderson, Rudolph Martin (1946): Catalogue of Canadian Recent mammals. National Museum of Canada Bull. 102, 238 pp.
 Bond, James H. (1948): From out of the Yukon. Binsford and Mort, Portland, Oregon. 220 pp.
 Clarke, C. H. D. (1946): Biological reconnaissance of the lands adjacent to the Alaska Highway in northern British Columbia and the Yukon Territory. 41 pp.
 Dufresne, Frank (1946): Alaska's animals and fishes. A. S. Barnes and Co., New York, pp. xviii, 297; illus. (13 coloured plates).

- Elton, Charles (1935): Notes on the mammals of the Upper Laird and Frances Rivers. *The Can. Field-Nat.*, vol. 49, No. 7, pp. 120-123.
- Judd, W. W. (1950): Mammals observed in the Yukon Territory, Canada, in the summer of 1949. *Journ. of Mammalogy*, vol. 31, pp. 360-361.
- Osgood, Wilfred H. (1900): Results of a biological reconnaissance of the Yukon River region—Mammals of the Yukon Region. *North American Fauna* No. 19, 100 pp., 7 plates.
- Osgood, Wilfred H. (1909): Biological investigations in Alaska and Yukon Territory. *North American Fauna*, No. 30, pp. 7-92.
- Rand, A. L. (1945): Mammal investigations on the Canol Road, Yukon, and Northwest Territories, 1944. *National Museum of Canada Bull.* 99, pp. 1-52, Map, 20 figures.
- Rand, A. L. (1945): Mammals of Yukon, Canada. *National Museum of Canada Bull.* 100, pp. 1-93, Map, 26 figures.
- Sheldon, Charles (1911): *The wilderness of the Upper Yukon; a hunter's explorations for wild sheep in sub-Arctic Mountains.* 354 pp., illus., New York.
- Williams, M. Y. (1925): Notes on the life along the Yukon-Alaska boundary. *The Can. Field-Naturalist*, vol. 29, No. 4, pp. 69-72.

NOTES ON A SMALL COLLECTION OF MAMMALS FROM PRINCE EDWARD ISLAND

By Austin W. Cameron

In view of the fact that the mammals of Prince Edward Island have never been reported on taxonomically as a group, it seems desirable to place on record a study of a small collection in the National Museum of Canada. Unfortunately, no mammalogical survey has ever been made on the Island, and the few specimens that have found their way into museum collections have been secured by local residents or visiting scientists whose collecting was incidental to other activities. It is to be hoped that eventually a mammalogical field party will devote a season to collecting there, since a clear understanding of the taxonomy, distribution, and speciation of the forms in the adjacent regions is possible only after such a study has been made. With the paucity of material available, it is possible here only to indicate in a very general way the affinities of the Island forms to those on the adjacent mainland.

Although the National Museum has a very small series from the Island, there is nothing to indicate that the mammalian fauna is appreciably poorer in species numbers than those of Cape Breton Island and other coastal islands. On the contrary, a thorough study will probably reveal the presence of a number of species that have not as yet been recorded. The following is a list of terrestrial mammals compiled from various published sources and from correspondence with local residents.

LIST OF TERRESTRIAL MAMMALS

1. **Maritime Cinereous Shrew** (*Sorex cinereus acadicus* Gilpin)

A single specimen in the National Collection was collected by J. R. Mutch at Mount Herbert during the winter of 1919-20. This specimen is clearly referable to the Maritime form by its large size and long tail.

2. **Pigmy Shrew** (*Microsorex hoyi thompsoni* (Baird))

The Chicago Museum of Natural History has one specimen from Alberton and two from Georgetown.

3. **Northeastern Short-tailed Shrew** (*Blarina brevicauda pallida* R. W. Smith)

Two specimens, one collected by J. R. Mutch at Mount Herbert, Queens County, on October 23, 1920, and the other by R. M. Anderson at Southport, Queens County, on September 6, 1924. This race, *pallida*, is the palest of the *brevicauda* group, and the two Prince Edward Island specimens are even paler than Nova Scotia material.

4. **Little Brown Bat** (*Myotis lucifugus lucifugus* (Le Conte))

The United States National Museum has three specimens from Mount Herbert.

5. **Red Fox** (*Vulpes fulva* subsp.)

Probably referable to *V. f. rubricosa*.

6. **Eastern Mink** (*Mustela vison vison* Schreber)

One specimen collected on July 19, 1950, by J. R. Mutch at Mount Herbert and identified by R. M. Anderson.

7. **Nova Scotia Varying Hare** (*Lepus americanus struthopus* Bangs)

This species is said not to be uncommon, although suitable habitat is restricted, because so much of the island is cleared for agricultural purposes. E. W. Nelson in his revision of the rabbits of North America examined one specimen from Alberton.

8. **Northeastern Chipmunk** (*Tamias striatus lysteri* (Richardson))

One specimen, a flat skin without skull, collected by J. R. Mutch at Mount Herbert, Queens County. The chipmunk occurring in the Maritime Provinces is *T. s. lysteri*. Compared with Ontario material, specimens from the Maritime Provinces are brighter and more richly coloured, but the two populations do not differ sufficiently to warrant the recognition of two subspecies.

9. **Nova Scotia Red Squirrel** (*Tamiasciurus hudsonicus gymniscus* (Bangs))

Two specimens, one melanistic, collected by J. R. Mutch at Mermaid, Queens County, during the winter of 1919-20.

10. **Maritime Deer Mouse** (*Peromyscus maniculatus abietorum* (Bangs))

Three immature specimens; two collected at Charlottetown on December 16, 1941, by B. F. Tinney and one at Hazelbrook, Queens County, on March 23, 1919, by W. J. Monaghan.

11. **Nova Scotia Red-backed Mouse** (*Clethrionomys gapperi rufescens* R. W. Smith)

R. M. Anderson collected two specimens on September 7 and 8, 1924, respectively, at Southport near Charlottetown. They are considerably paler than specimens of *C. g. ochraceus* from New Brunswick and compare favourably with a large series of *rufescens* from Nova Scotia. The measurements of the adult female are: total length: 165 mm.; tail: 47 mm.; hind foot: 20 mm; cranial breadth: 12.9 mm.; interorbital breadth: 4.3 mm.

12. **Acadian Meadow Mouse** (*Microtus pennsylvanicus acadicus* Bangs)

Two skulls of this species collected in 1919 by J. R. Mutch at Mount Herbert are in the National Collection. Bailey examined forty-seven specimens from the Island and found that they exhibited the principal characters of the race to an accentuated degree. It is interesting to note that this seems to hold true also for *Blarina*, *Zapus*, and possibly *Tamias*.

13. **Eastern Muskrat** (*Ondatra zibethica zibethica* (Linnaeus))

There are no specimens in the National Collection. Hollister examined two specimens from Mount Stewart when making his revision of North American muskrats.

14. **Acadian Meadow Jumping Mouse** (*Zapus hudsonius acadicus* (Dawson))

J. R. Mutch collected two specimens at Mount Herbert in 1919. The single skin compares favourably in colour with a series of *Z. h. acadicus* from Nova Scotia and is somewhat paler than specimens from western

New Brunswick now referred to *Z. h. canadensis*. The entire genus *Zapus* is sorely in need of revision, and it is probable that when sufficient material is assembled to make such a study possible it will be necessary to revise our interpretation of speciation in the genus.

15. Northern White-tailed Deer (*Odocoileus virginianus borealis* (Miller))

This species is said to be widely, although sparsely, distributed throughout the island.

The following is a list of the terrestrial mammals that have been introduced into the Island, or at least are believed to have been introduced.

1. **Raccoon** (*Procyon lotor*)
2. **Striped Skunk** (*Mephitis mephitis*)
Skunks have increased to such an extent that they now constitute a nuisance, and a bounty has been paid for their destruction over a number of years.
3. **Norway Rat** (*Rattus norvegicus*)
4. **House Mouse** (*Mus musculus*)

The following mammals are not known to occur on the Island, although further collecting may reveal their presence:

1. **Star-nosed Mole** (*Condylura cristata*)
2. **Water Shrew** (*Sorex palustris*)
3. **Eastern Long-eared Bat** (*Myotis keenii septentrionalis* Trouessart)
4. **Short-tailed Weasel** (*Mustela erminea richardsoni* Bonaparte)
5. **Woodchuck** (*Marmota monax*)
6. **Flying squirrel** (*Glaucomys sabrinus*)

BIBLIOGRAPHY

- Anderson, R. M. (1946): Catalogue of Canadian Recent mammals. National Museum of Canada Bulletin 102, pp. 1-238.
- Annual Report of the Department of Industry and Natural Resources of the Province of Prince Edward Island for the Year Ending March 31st, 1950. P. 25.
- Bailey, Vernon (1900): Revision of American voles of the Genus *Microtus*. North American Fauna No. 17, pp. 19-21.
- Hollister N. (1911): A systematic synopsis of the Muskrats. North American Fauna No. 32, pp. 16-18.
- Jackson, Hartley H. T. (1928): A taxonomic revision of the American Long-tailed Shrews. North American Fauna No. 51, pp. 40-50.
- Miller, G. S., Jr., and G. M. Allen (1928): The American bats of the genera *Myotis* and *Pizonyx*. U.S. Nat. Mus. Bull., vol. 144, pp. 1-218.
- Nelson, E. W. (1909): The rabbits of North America. North American Fauna No. 29, pp. 90-92.
- Rand, A. L. (1944): Canadian forms of the Meadow Mouse (*Microtus pennsylvanicus*). Canadian Field-Naturalist, vol. 57, Nos. 7, 8, pp. 115-123.

ZOOLOGICAL INVESTIGATIONS IN THE MARITIME PROVINCES

By E. L. Bousfield

During the summer of 1950, a preliminary survey of aquatic invertebrate fauna was conducted by the writer in the coastal regions of the Canadian Maritime Provinces. The services of Mr. Colin L. Thacker, who accompanied the author from June 1 to August 31, contributed greatly to the success of the field work. The purpose of the survey was twofold—namely: (1) to determine the distribution of the fouling barnacles of Canadian Atlantic coastal waters and find a locality suitable for detailed study of the ecology of estuarine forms, and (2), in connection with this work, to make a collection of marine and fresh-water organisms for acquisition to the invertebrate collections of the National Museum. The details of research in (1) are being continued in the 1951 field season.

For the loan of equipment vital to the project and for advisory assistance, the author wishes to express his appreciation and gratitude to Dr. A. W. H. Needler and members of the staff of the Atlantic Biological Station, to Mr. R. R. Logie and staff of the Prince Edward Island Biological Station, to Mr. R. A. McKenzie, District Biologist, Chatham, N.B., to Mr. Wilbur Longmire, Hillsburn, N.S., and to the many others who aided with their kindness and generous hospitality. Special mention is due Mr. J. M. M. Lamb, District Marine Agent, Saint John, N.B., who arranged a most interesting trip aboard the C. G. buoy tender *Dollard*. The author is also much indebted to the many research specialists who are giving taxonomic assistance to the investigation.

ITINERARY

The party left the Atlantic Biological Station at St. Andrews, N.B., on June 14 and travelled by automobile to Saint John, where the *Dollard* was weighing anchor for a three-day trip to the Passamaquoddy Bay area. Under ideal weather conditions, the work of changing buoys and recharging lights was carried out, with short stops at Beaver Harbour, Black's Harbour, and North Head, Grand Manan. On returning to Saint John, collections were made near Cape Spencer and at St. Martin's, and a visit was paid to the Fisheries Research Station at Petitcodiac, N.B. Leaving Moncton on June 19, the party spent a somewhat rainy week doing the Minas Basin area in detail and continued along the north shore of Nova Scotia to Digby on June 25. A trip aboard a scallop dragger to the *Hour Ground* off Hillsburn, N.S., resulted in a good collection of deep-water organisms. At Yarmouth on June 27, the *Dollard* was again encountered, laden with buoys recently lifted from Brier Island and neighbouring localities (see map). A series of stations along the outer coast of Nova Scotia was examined during the next five days, but foggy weather interfered with plans to photograph the more interesting beach areas. From then until July 7, good weather enhanced the survey of certain areas in scenic Cape Breton Island. The party then returned to Halifax, where buoys recently lifted by the C. G. S. *Lady Laurier* from stations along the outer coast of Nova Scotia were examined. After visiting shore areas

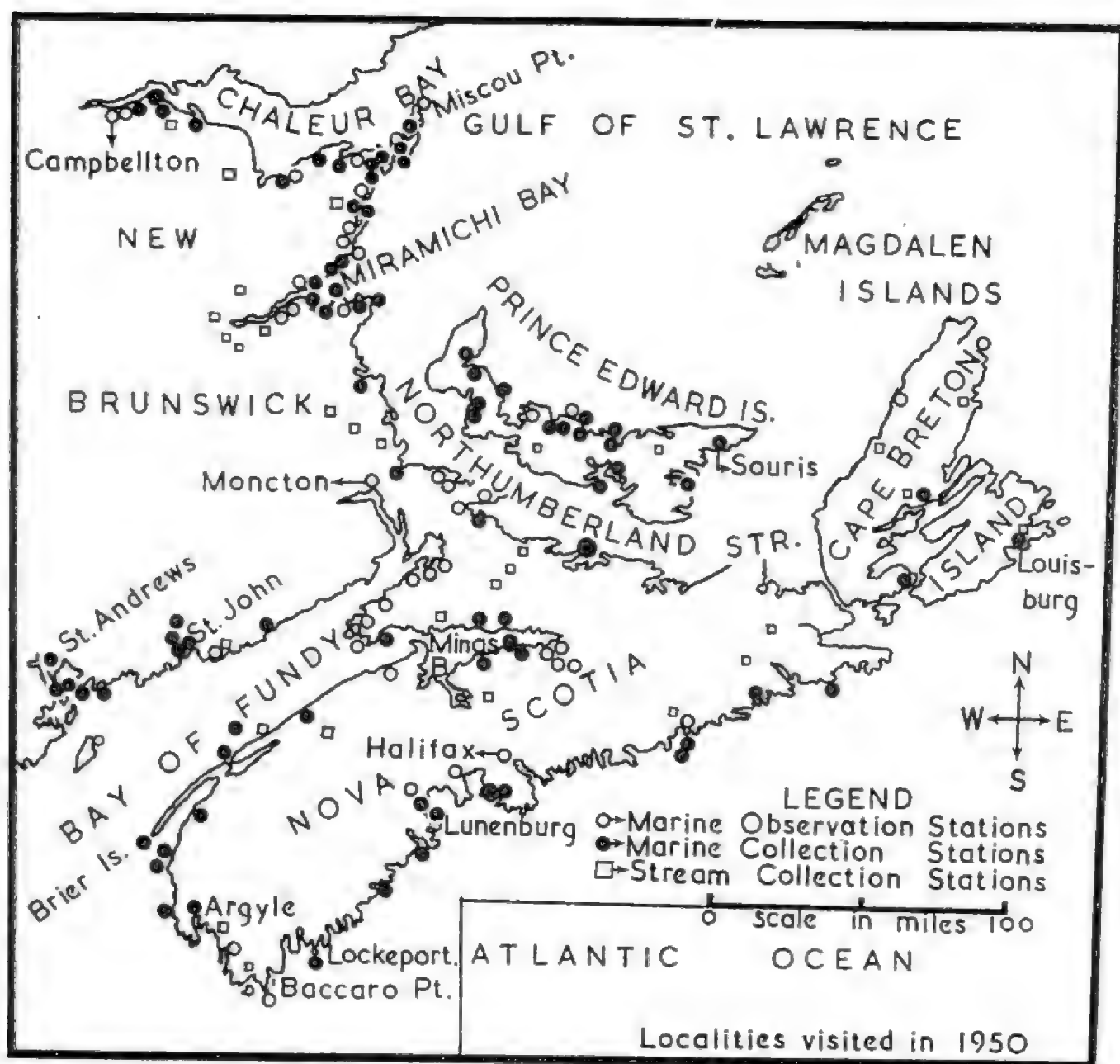


Figure 12. Localities visited in 1950.

from Malagash to Cape Tormentine, the party crossed over to Prince Edward Island and reached the biological station at Ellerslie on July 10. Under ideal weather conditions, buoys were examined in Hillsborough Bay, and shallow-water collections were continued in various parts of the island. Crossing back to the mainland on July 15, the party spent the next two days in examining shore stations which stretched northwards along the gulf coast of New Brunswick.

On the arrival of the party at Chatham, N.B., a preliminary survey of the fifty-mile-long Miramichi estuary was commenced. Hydrographical stations were established, and shore collections were continued. From July 27 to August 4, a profitable collecting trip was made along the picturesque coast road from Newcastle to Campbellton, N.B. A few days were spent in the Shippigan area, where, with the introduction of modern methods, oyster farming is rapidly becoming one of the chief industries. Having decided upon the Miramichi estuary as the area most suitable for the studies contemplated, the party devoted the month of August to a faunal and hydrographical survey of the region. Dredging operations

were concentrated in the 'critical' fresh-to-brackish water sections of the river, near the head of tide. Using the Clarke-Bumpus plankton sampler, it was possible to work out quantitatively the pattern of the plankton distribution in the estuary. During the final week of August, dredging operations were extended to selected parts of Miramichi Bay proper, and out into the Gulf of St. Lawrence.

Following Mr. Thacker's return to Ottawa on September 1, the author revisited the Shippigan area and continued the study of barnacle fouling on oyster spat collectors. He then returned to Chatham and completed an examination of intertidal stations in the Miramichi area by September 13. Returning to Saint John, he obtained good biological collections and observations above and below the reversing falls. It is expected that further study of the Saint John estuary will provide much new information on the distribution and general biology of the brackish-water invertebrates.

BEACH COMMUNITIES

One of the characteristic features of the Bay of Fundy is the very high tide, being 30 feet at Digby near the entrance to the bay and about 52 feet at Noel in Minas Basin (C. H. S., 1950). The deep mixing action of the tidal currents, however, tends to keep the surface waters ice-free in winter and cold in summer. As a result, the beaches are very wide, and the intertidal flora and fauna are well developed. Near Digby, the *Fucus* (rockweed) zone frequently extends to 20 feet above the mean low tide level, and the rock barnacle (*Balanus balanoides*) persists a few feet above this. The "seaweed" and other debris cast up by the waves at high-tide line is densely populated with beach fleas (*Orchestia platensis*), woodlice (*Porcellio scaber*), spiders, centipedes, and terrestrial insects. At mid-tide levels, the beach flea (*Hyale nilssoni*), the scud (*Gammarus marinus*), and the periwinkle (*Littorina litorea*) live among the *Fucus* and rock barnacles. Near low water, the scud (*Gammarus locusta*), the rock isopod (*Jaera marina*), the dog whelk (*Thais lapillus*), the limpet (*Acmaea testudinalis*), and the periwinkles (*Littorina* spp.) are prevalent.

In Minas Basin, the *Fucus* zone reaches more than 30 feet, and the barnacle zone 40 feet in height. The warm temperatures and lowered salinities of surface waters in the Basin during summer may be attributed to the enclosed nature and relative shallowness of the area. This effect is augmented by the heating of the extensive headwater mud flats which are exposed to the sun's rays at low water and by the many rivers which drain into the Basin. The writer is consequently in accord with Leim (1923) in finding, near the head of the Basin, warm-water organisms, such as the mud snail (*Nassa obsoleta*), the oyster drill (*Urosalpinx cinerea*), the long-finned squid (*Loligo pealii*), and the brackish-water barnacle (*Balanus improvisus*).

On the outer coast of Nova Scotia, tides are much lower, but ice erosion in winter is less severe. The *Fucus* zone is richly developed, and barnacles occur even on the exposed faces of granitic boulders. Proceeding eastward around Cape Breton Island, however, the beaches become increasingly subject to ice erosion, and the intertidal fauna is largely restricted to the crevices and protected angles among the rock formations. In the Bras d'Or Lakes, the very slight tide and brackish nature of the surface waters is correlated with the absence of an intertidal fauna.

The beaches of the gulf coast of Nova Scotia, New Brunswick, and Prince Edward Island present an entirely different picture. The tidal amplitude is nowhere very great (average about 5 to 6 feet), and the intertidal fauna is thus crowded into a narrow belt extending a few feet above the low water line. Outer beaches of the lagoons are sandy and, while ideal for bathers, are unsuitable for sessile marine animals. As did Stephenson (1949), the writer found that these forms are able to exist only where cliffs are exposed to the breakers, but, here again, the severe action of ice in winter on the easily-eroded sandstone limits the *Fucus* and barnacles to a few protected crevices only. Surface waters of the entire Gulf coast are warm in summer and somewhat less salt than pure sea water (Lauzier *et al.*, 1951). These conditions are reflected by the large number of warm-water forms which are elsewhere found only south of Cape Cod.

Among the beach debris at high-tide line may be found the beach flea (*Orchestia platensis*) and its larger associate, *Talorchestia longicornis*. The reduction of the *Fucus* and rock barnacle zone is compensated by the rich faunal development near low water line. Species very commonly encountered are the oyster (*Ostrea virginica*), the mussels (*Mytilus edulis*, *Modiolus demissus*), the slipper limpets (*Crepidula* spp.), the periwinkles (*Littorina* spp.), the mud snails (*Nassa* spp.), the scuds (*Gammarus locusta*, *G. annulatus*, and *Carinogammarus mucronatus*), the isopods (*Idothea balthica*, *I. phosphorea*), the shrimps (*Mysis stenolepis*, *Crago septemspinus*), the mud crab (*Neopanopeus*), and the barnacles (*Balanus crenatus*, *B. improvisus*).

Along the south coast of Chaleur Bay, beaches are more precipitous, and deformed rocks are more prominent locally, with a corresponding development of the *Fucus* and barnacle zones. Although surface waters are cool here in summer, certain warm-water 'indicators', such as *Balanus improvisus*, persist right up to Campbellton at the head of the bay. An investigation of the north shore of Chaleur Bay might show how far up the Gaspé coast these conditions prevail and perhaps establish the northern limit of distribution in North America for many of the species presently being studied.

MARINE FOULING

The fouling of ships, wharves, pilings, and buoys has always been a problem of great commercial importance. In addition, recent work by the Fisheries Research Board of Canada has increased the significance of barnacle fouling on oyster beds and oyster spat collectors. It is hoped that information bearing on the control of these fouling organisms will result from the present study.

The fouling of buoys in the Bay of Fundy and outer coast of Nova Scotia appears to be typical of the Gulf of Maine and cold-water areas in general. Marine algae (*Fucus*, *Ascophyllum*, *Laminaria*, etc.) are abundant on the buoy itself and for some distance down the mooring chain. The principal invertebrate foulers are the barnacles (*Balanus balanoides* at the surface, and *B. crenatus* in greater depths) and the mussels (*Mytilus edulis*), the latter settling in dense clusters and growing so rapidly as to smother out the barnacles beneath. Extending down the mooring chain to the concrete sinker are clusters of the stalked ascidian (*Boltenia ovifera*), the mussel (*Mytilus*), the starfish (*Asterias vulgaris*), the sea urchin



Can buoy off St. Andrews Island, N.B., illustrating fouling.

(*Strongylocentrotus dröbachiensis*), the sea cucumber (*Cucumaria frondosa*), and the sea anemone (*Metridium dianthus*). These animals are in turn enmeshed by dense growths of hydroids and are encrusted by bryozoans of the genus *Membranipora*. Among this tangle of marine organisms crawl vast numbers of amphipods, chiefly *Jassa marmorata* and *Caprella linearis*. Buoys along the west coast of Nova Scotia are periodically fouled by goose barnacles (*Lepas hilli*) which drift in from the Gulf Stream as larval stages. Offshore buoys frequently show fouling by the deep water barnacles (*Balanus balanus*, *B. hameri*), while those in harbours and river mouths of that area are fouled by the brackish-water barnacle (*B. improvisus*). In the Gulf of St. Lawrence, *B. improvisus* replaces *B. balanoides* as the principal fouling barnacle in shallow water, but *Mytilus edulis* is still present in vast numbers. Although Gulf buoys are in the water for but a short period each summer, growth rates are so high in prevailing surface temperatures that fouling organisms quickly settle and grow very thickly upon them.

As a result of this limited survey, it appears that fouling takes place in spring and early summer in the Bay of Fundy and during summer in the Gulf of St. Lawrence. When more detailed information on the breeding seasons of the various fouling organisms is made available, it may be possible to predict their periods of maximal settlement and so avoid changing buoys in the area until after the set. This method of approach is currently being investigated with respect to barnacle fouling on oyster spat collectors, and the results will be forthcoming in subsequent publications.

Barnacle fouling of scallop shells in the Bay of Fundy, although not a serious problem, has always intrigued the local fishermen. The chief foulers are the deep-water barnacles (*Balanus balanus*, *B. hameri*, and *B. crenatus*). The present investigation has thrown new light on the larval stages of the first two species and fixed their breeding seasons, which were hitherto unknown on the American Atlantic coast.

SUMMARY

During the summer of 1950, approximately 335 marine stations were visited and a total of more than 15,300 shallow-water marine invertebrates were collected. The following winter, the marine invertebrates were sorted into 893 lots, representing 18 principal animal subdivisions, and were tentatively identified. Approximately 250 species were recognized, with more than 30 species in each of the Annelida, Amphipoda, Pelecypoda, and Gastropoda. Only five species of the acorn barnacle *Balanus* were found, but the large number of specimens obtained (more than 8,700) is the result of a special search for these forms.

In addition, some 66 plankton samples were taken, mostly in the Miramichi estuary, and of these, 56 have been preserved. Quantitative examination of the Miramichi material shows that marine plankters occur in greatest numbers near the bottom (during daylight) and towards the Gulf of St. Lawrence, with least at the surface, and in the fresh-water of the river proper. The large concentration of marine plankton in deep water above Newcastle is presently ascribed to the mechanism by which these organisms are retained in large estuaries and which has been illustrated by Rogers (1940).

It was felt that a study of the upper part of estuaries would entail a knowledge of the fresh-water bottom fauna. As such information is not yet published for the area concerned, it became necessary to study the distribution of these organisms first-hand. Accordingly, 31 fresh-water stations throughout the Maritime Provinces were visited (see map) and some 2,600 bottom invertebrates (largely larval and nymphal insects) were collected. These were subsequently sorted into 125 lots representing six principal and several minor invertebrate groups. The relatively large number of species in the lot (approx. 225 species) may be attributed to the great geographical distances between stations, to the seasonal spread in collecting, and to the fact that the streams differed in size, origin, and temperature classification. Entomologists particularly interested in the area have reported on the collection of Odonata (19 species) and the Plecoptera (22 species). The Trichoptera are estimated to number more than 30 species and the Ephemera more than 110 species. Some of these organisms extend downstream into tidal areas, even into slightly brackish water, so that cases were observed where mayflies, caddis flies, and midge larvæ occurred on the same substratum as young brackish-water barnacles, amphipods, and hydroids.

REFERENCES

1. Canadian Hydrographic Service, (1950): Tide tables for the Atlantic Coast of Canada 1950. Tidal Publication No. 1.
2. Lauzier, L., R. W. Trites, and H. B. Hachey, (1951): Some features of the surface layer of the Gulf of St. Lawrence. Publ. Joint Committee on Oceanogr., Atl. Oceanogr. Group, St. Andrews, N.B., March, 1951.
3. Leim, A. H., (1923): The fauna of Minas Basin. MS. Report, Biological Stations, Fish. Res. Bd., Canada, No. 278, 1923.
4. Rogers, H. M., (1940): Occurrence and retention of plankton within the estuary. Journ. Fish. Res. Bd. Can. 5(2):164-171, 1940.
5. Stephenson, T. A., and Anne, (1949): Report on the second visit to North America during 1948. Special publication, University College of Wales, Aberystwyth, 1949.

NOTES ON THE BIRDS OF SOME JAMES BAY ISLANDS

By T. H. Manning and D. F. Coates

Included in this paper are only the barren or near-barren islands of central James Bay which were visited either by Coates in 1947 or by Manning in 1949. Charlton Island, where Coates also collected birds in 1947, is well wooded and ecologically similar to the adjacent mainland and has therefore been omitted from the present paper. Akimiski Island, which was visited by Manning in 1947, is also wooded, and his records from there have been included in a paper on the birds of the west James Bay coast (Manning, 1952). The Paint Hills Islands and some of the other islands of the east James Bay coastal fringe visited by Manning and A. Macpherson in 1950 will also be dealt with elsewhere. Lewis and Peters (1941) give a list of birds observed on the Strutton Islands in 1940, but since there are no subsequent records for these islands, it is unnecessary to repeat the list here.

Of the eleven islands included in this paper, only the Twin Islands appear to have been visited previously by ornithologists. A few specimens in the National Museum were collected by Frits Johansen on South Twin Island in 1920 when he was working for the Biological Board of Canada. These specimens have been examined and included here. In 1935, R. L. Fricke of the Carnegie Museum collected birds on the Twin Islands from July 20 to August 5 (Doutt, 1935), but the results of this work have not been published.

In 1947, Coates (1948, 1951) and his assistant, D. B. Coombs, were establishing astronomical control stations for the Geodetic Survey of Canada, and bird collections could be made only when the weather conditions made the primary work impossible. In 1949, Manning (1950) was leader of the Geographical Bureau's expedition which was on its way to Foxe Basin. On this occasion also, bird collecting was of secondary importance, and only brief stops could be made at the various islands while awaiting suitable conditions for the geographical and other work.

Manning was assisted in the zoological work by A. Macpherson, who collected about a third of the specimens. The estimated total bird populations given for some of the small James Bay islands were arrived at in conjunction with Macpherson, but his individual observations are not given when they duplicate Manning's, except for Pebble Island, where he worked on a different part of the island. Unless otherwise stated, Coates is the authority for all the sight records of 1947, and Manning for those of 1949. Manning is also responsible for the taxonomic remarks on the specimens, all of which are now in the National Museum of Canada. W. K. W. Baldwin, botanist at the National Museum, was a member of the 1949 expedition. He made collections of plants at all the islands visited except Bear Island and Pebble Island, and his resulting records for Gasket Shoal and Solomons Temple Island will be published in the Annual Report of the National Museum for 1952-53.

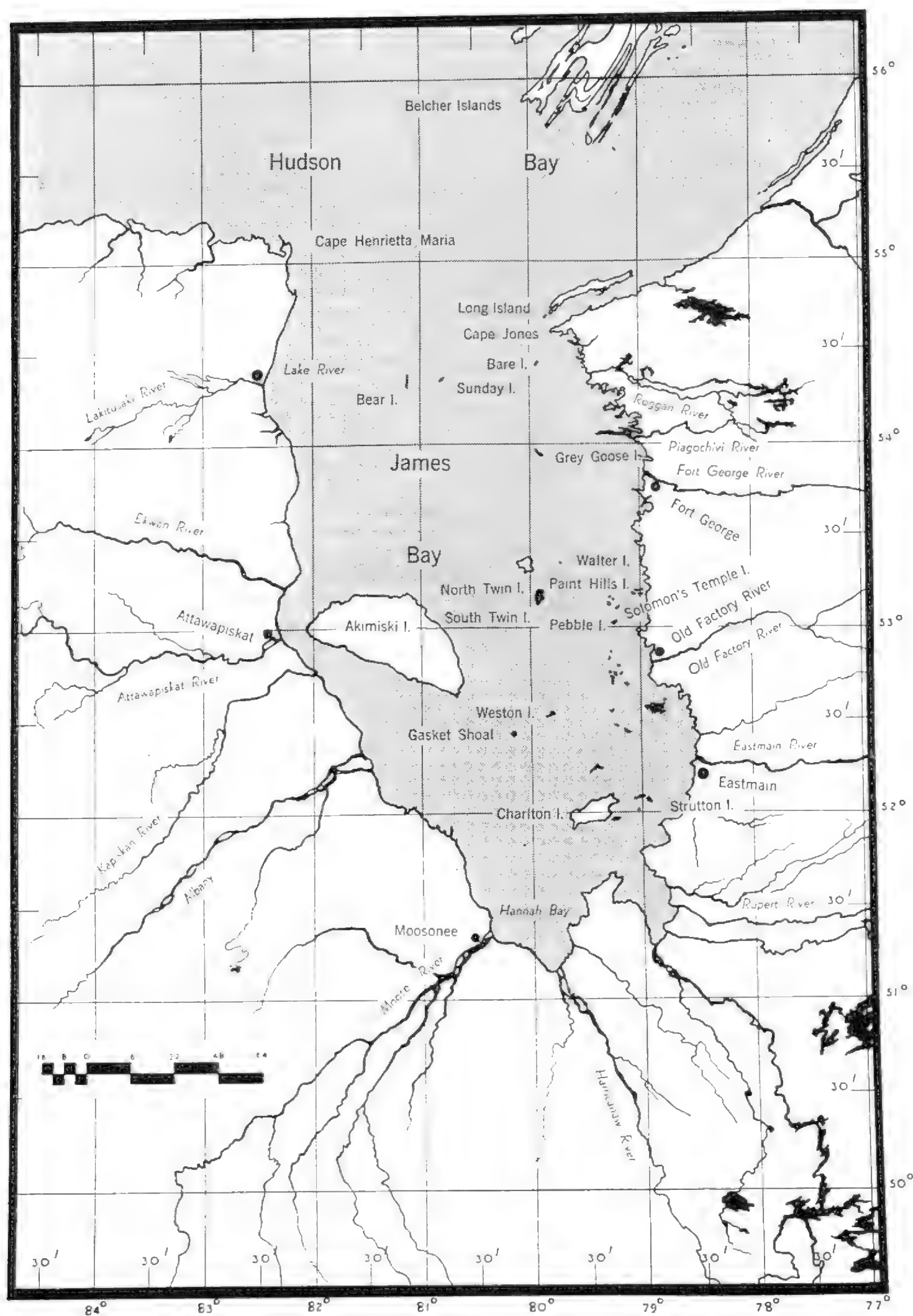


Figure 13. Map of James Bay Islands.

DESCRIPTION OF ISLANDS VISITED

*Gasket Shoal*¹: Manning, July 9-11, 12-13, 1949; 4 hrs. observing (July 9-10 only).

Weston Island: Coates, July 16-19, 1947.

Weston Island consists of sand and gravel and has a general elevation of about 60 feet.² The surface is covered with tussock tundra and small ponds. There are some dwarf willow and a few scattered groups of spruce up to 12 feet high. On the south side of the island 60-foot gravel cliffs rise at an angle of 60 degrees. These cliffs run in an east-west direction and make a distinctive landmark from seaward.

*Pebble Island*¹: Manning, July 17, 1949; 1 hr. observing.

Pebble Island is a flat island not more than 30 feet high. Between the bare, raised pebble beaches are areas of short, dry vegetation and fairly extensive patches of dwarf willow, seldom more than 3 feet high. There are about six clumps of spruce, not more than 5 feet high, and a few small, shallow lakes.

*Solomons Temple Island*¹: Manning, July 14-18, 1949; 5 hrs. observing.

South Twin Island: Manning, July 18, 1949; 4 hrs. observing.

Our brief visit ashore was made on the north side of the bay a few miles north of the southeast point of the South Twin Island. Along most of the shore of this bay, a wide mud and boulder tidal flat is followed by a low beach. A few hundred yards from the beach is a steep, wave-cut terrace about 25 feet high. This terrace gives good shelter from the north, and on the flat below it are a few ancient white spruce growing singly to a height of about 12 feet. Farther inland up the valley at the head of the bay, we saw but did not visit a group of these trees. Near the shore there were some small patches of willow up to about 6 feet high, and more extensive areas 2 to 3 feet high. Even on the flat plateau above the ridge, two or three white spruce, 6 feet high, were seen, as well as patches of dwarfed spruce scrub about 4 feet high. On this plateau there were several lakes, usually surrounded by a ring of low willow. The remainder of the plateau was covered with heath-like flora of lichen, *Empetrum*, and grasses.

North Twin Island: Coates, July 19-21, 1947.

Observations on North Twin were limited to the bay on the south side of the island. This bay formed an excellent anchorage with deep water to within 100 feet of shore. To the north and south of the bay, 80-foot cliffs of sand and gravel lay within 400 feet of the shore, but at the bay itself, they receded inland about a mile. Above the cliffs the land rose rapidly for another 40 feet and then flattened out into level tundra with scattered lakes, patches of dwarf willow and birch, and an occasional spruce tree growing up to 8 feet high.

Walter Island: Coates, July 21, 1947.

Walter Island measures about $1\frac{1}{2}$ miles in a north-south, and half a mile in an east-west, direction. It consists of glacial till, principally rocks and

¹ A description of these islands by W. K. W. Baldwin will be published in the Annual Report of the National Museum for 1952-53.

² All heights given are estimates.

boulders covered with moss and lichen. There are no spruce. At the southern end, the land rises sharply to a height of 50 feet, then slopes gently down to the northern point. There were a few small lakes about which ducks and geese were nesting. On July 21, there were still a few patches of old snow.

Grey Goose Island: Coates, July 27–August 3, 1947.

Grey Goose Island is about 45 feet high and about three-quarters of a mile across in all directions. It consists principally of sand with only a few scattered rocks. Along most of the shore there is a wide beach followed by two 15-foot-high terraces. The surface of the sand is well covered with short vegetation, including caribou lichen, billberry, beach pea, and dwarf willow.

Bear Island: Coates, August 13–19, 1947. Manning, July 19–23, 1949; 2½ hrs. observing on July 21 only.

Bear Island is about 3 miles north and south, and one mile east and west. It is formed by an outcrop of hard blue and red slate rising about 40 feet above sea-level. Numerous small lakes fill the depressions, while the ridges are chiefly bare rock. There are a few small patches of marsh grassland, and Manning saw one clump of dwarf willow under a foot high, covering an area of about 3,000 square yards. Thirty-one species of flowering plants were collected by Coates for the National Museum.

Sunday Island: Manning, July 22, 1949; 2 hrs. observing.

Sunday Island is formed by a small, low outcrop of hard limestone covered by numerous massive pieces of loose rock, under which are ideal nesting sites for the abundant guillemot population. There is no sizable area of continuous vegetation.

Bare Island: Coates, August 19–21, 1947.

Bare Island is a dome-like outcrop of pink and white granite about 35 feet high, a quarter of a mile long east and west, and somewhat less in breadth. A fair amount of bakeapple was in fruit, but other vegetation was scarce.

SYSTEMATIC LIST

Red-throated Loon, *Gavia stellata* (Pontoppidan)

South Twin Island. One seen on July 18, 1949. A partially feathered downy in the National Museum was collected by Johansen on July 27, 1920.

Pacific Loon, *Gavia arctica pacifica* (Linnaeus)

South Twin Island. An adult female in the National Museum was collected by Johansen on July 27, 1920.

Grey Goose Island. A male (testis, 15 mm.) was collected on August 1, 1947.

Ungava Canada Goose, *Branta canadensis interior* Todd

Weston Island. On July 18, 1947, six adults and twenty downies were seen, and a flightless female (culmen, 52 mm., tarsus, 86 mm.) and three large downies were collected.

Solomons Temple Island. A pair alighted on Solomons Temple Island on July 15, 1949. They soon left and were not seen again.

South Twin Island. A flock was seen on July 18, 1949. A partially feathered downy in the National Museum collection was obtained by Johansen on July 18, 1920, and a flightless female (culmen, 49 mm., tarsus, 81 mm.) on July 22.

Grey Goose Island. The Indians with Coates shot two on July 31, 1947.

Sunday Island. C. A. Burns, geologist on the Geographical Bureau's expedition, saw one on July 23, 1949.

Lesser Snow Goose, *Chen hyperborea hyperborea* (Pallas)

The Lesser Snow Goose undoubtedly visits some of the James Bay islands in migration, and occasionally some may remain through the summer and possibly nest.

Twin Islands. Macoun (1900, p. 114) lists a set of three Snow Goose eggs obtained from one of the Twin Islands in 1898. These three eggs, which are in the National Museum, measure respectively 80 mm. (approx.) x 58 mm., 80 mm. (approx.) x 55 mm., and 78 mm. (approx.) x 55 mm. Low did not himself visit the Twin Islands in 1898, and according to the label, these eggs were collected by an Eskimo. They are not definitely separable from eggs of the Canada Goose.

American Pintail, *Anas acuta tzitzihua* Vieillot

Gasket Shoal. On July 10, 1949, a single Pintail was seen flying over the island.

South Twin Island. On July 18, 1949, Pintails were quite numerous and obviously nesting.

Old-squaw, *Clangula hyemalis* (Linnaeus)

South Twin Island. An adult female in the National Museum collection was taken by Johansen on July 22, 1920.

Grey Goose Island. On July 27, 1947, two adults were seen with about five downies.

Bear Island. Four adult Old-squaws (two collected) and twenty-one downies (four collected) were seen during a 2½-hour walk on July 21, 1949. The downies were two to three times their size at hatching and probably 10 days old.

King Eider, *Somateria spectabilis* (Linnaeus)

Gasket Shoal. Between July 9 and 11, 1949, about twenty-five male King Eiders were seen flying in small flocks. No females of this species were identified, and it is unlikely that any were nesting there.

South Twin Island. An adult female and a partially feathered downy in the National Museum collection were taken by Johansen on July 18, 1920.

Hudson Bay Eider, *Somateria mollissima sedentaria* Snyder

Gasket Shoal. In 1949, there were about 200 nests of the Hudson Bay Eider on this island. The greatest concentration was along the north shore, where there was an average of one nest to about every 10,000 square yards. When we first arrived at the island on July 9, several eggs were pipped, and a few had hatched, but we did not see any young in the

sea until the 10th. By July 12, nearly all the eggs had hatched. Besides nesting birds, there were several small flocks of single birds feeding at sea or in the tide flats. About 15 per cent of these were males. Five adult females and four downy young were collected.

Solomons Temple Island. Between July 15 and 17, 1949, two females with downy young and a few single females were seen in the sea near the island.

Grey Goose Island. Many families were seen here, and an adult female and one downy young, not more than 5 days old, were collected from a group of about ten.

Bear Island. In 2½ hours walking on July 21, 1949, eight Hudson Bay Eiders were seen on the small lakes. In addition, about forty (one collected) were seen in the harbour from the boat between July 19 and 22. One downy Hudson Bay Eider found dead was collected, but no live young were seen. Two females were collected on August 15, 1947, and on August 18, two flocks, one of twenty-one and the other of fifty Hudson Bay Eiders, were seen.

Our six specimens of downy young are well matched, and easily separable from a comparable brood of *S. m. borealis* from Cape Dorset, Baffin Island, by their much lighter colour, especially about the head and face. They can equally easily be distinguished from a slightly older downy *S. m. dresseri* from Grand Manan, New Brunswick. The measurements of our nine adult females from the James Bay islands are: wing chord, 287 (272-305) mm.; culmen, 49.8 (47-52) mm.; length of lateral bill process, 21.8 (19-24) mm.; width of bill process 6.5 (5-7.8) mm.; relation of lateral feathering to posterior edge of nostril (see Snyder, 1941) -0.8 (0- -2.0) mm.

White-winged Scoter, *Melanitta deglandi* (Bonaparte)

Solomons Temple Island: One White-winged Scoter was seen on July 17, 1949.

Willow Ptarmigan, *Lagopus lagopus ungavus* Riley

Pebble Island: On July 17, 1949, two pairs of Willow Ptarmigan were seen during an examination of about half this island.

Solomons Temple Island: Large accumulations of ptarmigan droppings were seen under the two small spruce trees, and on July 14, 1949, one pair of Willow Ptarmigan and perhaps an additional single male appeared to be resident. The female, which was collected, had been incubating, but no nest could be found.

South Twin Island: During a 4-hour walk on July 18, 1949, five Willow Ptarmigan were seen.

As might be expected from the proximity of Solomons Temple Island to the east James Bay coast, our single female (bill from anterior end of nostril to tip, 11 mm., width of bill at gape, 14.2 mm.) is referable to *L.l.ungavus*. The Twin Island birds may be referable either to *L.l.ungavus* or *L.l.albus*. The former is not improbable, since the Willow Ptarmigan population is much greater on the east coast of James Bay than on the west.

Semipalmated Plover, *Charadrius hiaticula semipalmatus* Bonaparte

Weston Island: Twenty-three Semipalmated Plovers were seen (male collected) during a 2½-hour walk on July 17, 1947.

Pebble Island: Five were seen during an hour's walk on July 17, 1949.

Solomons Temple Island: Only one seen (collected) in a 5-hour walk on July 15, 1949.

South Twin Island: Eight seen during a 4-hour walk on July 18, 1949. Two adult males in the National Museum collection were obtained by Johansen on July 22 and 23, 1920.

North Twin Island: Plentiful between July 19 and 21, 1947.

Grey Goose Island: Plentiful between July 27 and August 3, 1947.

Bear Island: A few seen between August 13 and 19, 1947. Eight seen during a 2½-hour walk on July 21, 1949.

Sunday Island: Thirty seen during 2 hours on July 23, 1949.

Semipalmated Plovers probably nest on all the above islands except Solomons Temple Island.

Ruddy Turnstone, *Arenaria interpres morinella* (Linnaeus)

Bear Island. A few seen between August 13 and 19, 1947.

Sunday Island. Three were seen feeding near the beach on July 23, 1949.

Hudsonian Curlew, *Numenius phaeopus hudsonicus* Latham

Grey Goose Island: A female (ovary 9 mm.) was collected from a flock of about eight on August 2, 1947.

Spotted Sandpiper, *Actitis macularia* (Linnaeus)

Gasket Shoal. Macpherson saw two during 10 hours observation between July 9 and 12, 1949.

Pebble Island. One was collected on July 17, 1949.

Solomons Temple Island. One was seen on July 15, 1949.

It seems unlikely that Spotted Sandpipers nest on these barren islands, although apparently they are frequently visited by wanderers.

Least Sandpiper, *Erolia minutilla* (Vieillot)

Gasket Shoal. Macpherson saw ten (one collected) during 10 hours walking between July 9 and 12, 1949. No indication of nesting was noted.

South Twin Island. Ten were seen during a 4-hour walk on July 18, 1949. Some of these were almost certainly nesting.

Bear Island. One small sandpiper seen on July 21, 1949, was thought to be of this species.

White-rumped Sandpiper, *Erolia fuscicollis* (Vieillot)

Grey Goose Island. About seven were seen and one collected on August 2, 1947.

Bear Island. Two were collected on August 18, 1947, from a mixed flock of about twenty Semipalmated and White-rumped Sandpipers.

Semipalmated Sandpiper, *Ereunetes pusillus* (Linnaeus)

Gasket Shoal. Fourteen (one collected) were seen by Macpherson during 10 hours walking between July 9 and 12, 1949.

Pebble Island: Eight (one collected) were seen by Manning, and five by Macpherson during an hour's walk on July 17, 1949. They were all in small flocks.

South Twin Island. Ten were seen during a 4-hour walk on July 18, 1949. A male in the National Museum collection was taken by Johansen on July 18, 1920.

Bear Island. On August 18, 1947, one was collected from a flock of twenty Semipalmated and White-rumped Sandpipers, and on July 21, 1949, two (one collected) were seen during a 2½-hour walk.

Sunday Island: Fifteen were seen during a 2-hour walk on July 23, 1949.

Some Semipalmated Sandpipers may have been nesting at all the above islands except Gasket Shoal.

Northern Phalarope, *Lobipes lobatus* (Linnaeus)

Weston Island. Two adult males were collected on July 18, 1947.

South Twin Island. Three were seen during a 4-hour walk on July 18, 1949. A male in the National Museum collection was taken on July 18, 1920, and two others on July 22 by Johansen.

Grey Goose Island. A male and a partially feathered downy were collected on July 29, 1947.

Bear Island. Two were seen during a 2½-hour walk on July 21, 1949.

Herring Gull, *Larus argentatus smithsonianus* Coues

In 1947, Coates saw Herring Gulls at most of his stops in James Bay.

Gasket Shoal. Between July 9 and 12, 1949, there appeared to be a resident population of about sixty adult Herring Gulls (four adults and one downy collected). Most of these had probably nested on the island. A large number of downy young as well as some nests with eggs were seen. Six immature Herring Gulls were seen at different times in the vicinity of the island.

Pebble Island. On July 17, 1949, six adult Herring Gulls were seen.

Solomons Temple Island. About ten adult Herring Gulls were usually to be seen here between July 15 and 17, 1949. They were probably nesting or had nested on the small, rocky islands nearby.

South Twin Island. Eight adults were seen flying over on July 18, 1947.

Bear Island. Three were seen during a 2½-hour walk on July 22, 1949.

Arctic Tern, *Sterna paradisaea* Pontoppidan

Gasket Shoal. Arctic Terns nest here in great numbers.

When we arrived on July 9, 1949, some downy young were already running around, but the majority of eggs were still unhatched when we left four days later. The total adult tern population was estimated at 2,000 to 3,000 birds, with an average of one nest to every 1,000 square yards. The greatest concentration of nests was near the north and south-west shores. Three adults were collected from Gasket Shoal.

Pebble Island. Six were seen by Manning, and twenty by Macpherson during an hour's walk on July 17, 1949.

Solomons Temple Island. Thirty were seen in 5 hours walking between July 15 and 17, 1949.

South Twin Island. Three were seen during a 4-hour walk on July 18, 1949.

Walter Island. On July 21, 1947, sixty were seen together. A specimen in the National Museum was taken near here (lat. $53^{\circ} 16'$, long. $79^{\circ} 42'$) by Johansen on July 22, 1920.

Grey Goose Island. On July 29, 1947, 150 were seen together, and one was collected.

Bear Island. Several were seen on August 18, 1947. On July 21, 1949, three were seen on a $2\frac{1}{2}$ -hour walk.

Sunday Island. Two hundred (one collected) were seen during a 2-hour walk on July 23, 1949.

Bare Island. On July 19, 1947, there were about 200 on the island.

All the terns seen on these James Bay islands have been identified as Arctic Terns on the strength of the five specimens examined. Probably Common Terns do not normally breed on these islands, although some wanderers doubtless visit them.

Nearctic Mandt's Guillemot, *Cepphus grylle ultimus* Salomonsen

Gasket Shoal. Five were seen at sea in the vicinity of this island between July 9 and 14, 1949.

Pebble Island. Four were seen near this island on July 17, 1949.

Solomons Temple Island. Between July 15 and 17, 1949, about thirty appeared resident in this neighbourhood and probably nested on some of the small, rocky islands nearby.

Sunday Island. At least 700 (fifteen collected) Black Guillemots were resident here. Many of them had eggs or young under the large boulders which were scattered over a considerable part of the island.

Bare Island. Two were collected on August 19, 1947.

The James Bay guillemots, as exemplified by specimens from Sunday and Bare islands, clearly belong to the *mandtii* group and show no signs of intermixture with the Gulf of St. Lawrence population. In nine out of ten males and one out of seven females, the greater wing coverts are white to the base of the feathers, and the average length of the white in the remaining seven is 33.3 (29-36) mm. (see Salomonsen, 1944, p. 62, for the method of measurement). The exposed culmen of ten males averages 28.4 (25-30) mm., and for seven females, 26.9 (25-29.5) mm. This is about the same as the averages for northwest Greenland (Salomonsen, 1944, p. 96) and for Hudson Bay and western Hudson Strait (Manning, 1949) populations which have been referred to this race. However, owing to the variable amount of overlap of the feathers from the side of the bill, the culmen measurements are hard to duplicate exactly, even by the same worker. A more exact measurement, and one which should give the same results, is from the tip of the bill to the base of the feathers at the anterior point of the feathering on the side of the maxilla. For our ten James Bay males, this measurement averages 21.9 (19-23.2) mm., and for seven James Bay females, 21.0 (19-23) mm. The mean wing chord measurement for our ten James Bay males is 159.1 (151-165) mm.,

and for seven females, 160.4 (155-165) mm. These are small compared with the wing measurements given by Salomonsen (1944) for this race, but his probably referred to the flattened wing.

Northern Horned Lark, *Eremophila alpestris alpestris* (Linnaeus)

Gasket Shoal. On July 10, 1949, the adult population on this island was estimated to be 300. Five adults and two juveniles were collected.

Weston Island. Twelve (two collected) were seen during a 2½-mile walk on July 17, 1947.

Pebble Island. The Horned Lark population here was slightly denser than on Solomons Temple Island.

Solomons Temple Island. About thirty pairs, several of which had young, were resident here between July 15 and 17, 1949. Four adults and two juveniles were collected.

South Twin Island. Twelve were seen during a 4-hour walk on July 18, 1949.

Walter Island. Several were seen on July 21, 1947.

Grey Goose Island. Two were collected between August 1 and 2, 1947.

Bear Island. Fifteen were seen during a 2½-hour walk on July 21, 1949.

American Pipit, *Anthus spinoletta rubescens* (Tunstall)

Pebble Island. Three each were seen by Macpherson and Manning during an hour's walk on July 17, 1949.

Solomons Temple Island. On July 15, 1949, there were about two pairs to every 10,000 square yards of this island. No young were seen. Eleven specimens were collected.

South Twin Island. Three were seen during a 4-hour walk on July 18, 1949.

Grey Goose Island. Five were collected between August 1 and 2, 1947.

Bear Island. Four were seen during a 2½-hour walk on July 21, 1949.

Common Redpoll, *Acanthis flammea flammea* (Linnaeus)

Gasket Shoal. A male was collected on July 9, 1949.

Solomons Temple Island. A male was collected on July 15, 1949.

Churchill Savannah Sparrow, *Passerculus sandwichensis oblitus* Peters & Griscom

Weston Island. Three were collected on July 17, 1949.

Pebble Island. Ten each were seen by Macpherson and Manning during an hour's walk on July 17, 1949.

Solomons Temple Island. Only one Savannah Sparrow (collected) was seen here between July 15 and 17, 1949.

South Twin Island. Six were seen on South Twin Island during a 4-hour walk on July 18, 1949.

North Twin Island. One was seen on North Twin Island on July 20, 1949.

Bear Island. One was seen and collected during a 2½-hour walk on July 21, 1949.

Tree Sparrow, *Spizella arborea arborea* (Wilson)

South Twin Island. On July 18, 1947, fifty were counted during a 4-hour walk.

Eastern Chipping Sparrow, *Spizella passerina passerina* (Bechstein)

Gasket Shoal. A female was collected on July 10, 1949.

White-crowned Sparrow, *Zonotrichia leucophrys leucophrys* Forster

South Twin Island. One was seen on July 20, 1947.

North Twin Island. A pair was seen on July 18, 1949.

Lincoln's Sparrow, *Melospiza lincolnii lincolnii* Audubon

South Twin Island. One which may have been nesting was seen in a tall willow thicket on July 18, 1949.

Lapland Longspur, *Calcarius lapponicus lapponicus* (Linnaeus)

South Twin Island. Seven were seen during a 4-hour walk on July 18, 1949. An adult male in the collection of the National Museum was taken by Johansen on July 22, 1920.

REFERENCES

- Coates, D. F. (1948): Geodetic Service of Canada descriptive report of James Bay areas seen while establishing land control points in 1947. 31 + 61 (photos) pp. maps, mimeo.
- (1951): Mapping the North. *Can. Geog. Journ.* vol. 43, pp. 58-69.
- Doutt, Margaret T. (1935): Twin Islands: an Arctic outpost. *Carnegie mag.*, vol. 9, pp. 195-200.
- Lewis, Harrison F. and Harold S. Peters (1941): Notes on birds of the James Bay region in the autumn of 1940. *Can. Field-Nat.*, vol. 55, pp. 111-117.
- Macoun, John (1900): Catalogue of Canadian birds. Pt. I, Water Birds, Gallinaceous Birds, and Pigeons. *Geol. Surv., Canada, Publ. No. 692*, pp. 1-218.
- Manning, T. H. (1949): Birds of Northwestern Ungava. Pp. 155-224, map: Appendix to "A Summer on Hudson Bay," by Mrs. Tom Manning. London.
- — — (1950): The voyage of the C.G.M.V. *Nauja* to Foxe Basin in 1949. Typed report to the Geographical Bureau, Ottawa. 151 pp.
- (1952): Birds of the southern coast of Hudson Bay and west coast of James Bay. In press.
- Salomonsen, Finn (1944): The Atlantic Alcidae. *Medd. Göteborgs Mus. Zool. Avdelning* 108. 138 pp.
- Snyder, L. L. (1941): On the Hudson Bay Eider. *Oce. Pap. Roy. Ont. Mus. Zool.* No. 6. 7 pp.



A. July 18, 1947. The south shore of Weston Island.

(D. F. Coates)



B. July 18, 1949. Looking inland or southwest from the edge of the plateau at the north side of the bay at the south end of the east coast of South Twin Island.

(W. K. W. Baldwin)



A. Aug. 14, 1947. Central part of Bear Island.

(D. F. Coates)



B. July 23, 1949. Guillemots on Sunday Island.

(T. H. Manning)

BOTANICAL INVESTIGATIONS IN MANITOBA IN 1950

By H. J. Scoggan

Following botanical surveys by canoe of the country between northern Lake Winnipegosis and Hudson Bay during the summers of 1948 and 1949 (see Annual Reports for 1948-49 and 1949-50), the 1950 season was spent in the prairie and wooded areas of south and central western Manitoba, and in the interior barren ground region on and below the sixtieth parallel.

A panel truck was used for the work in the south, which included a survey of Turtle Mountain and the adjacent prairie region, followed by work in the Riding, Duck, and Porcupine Mountain forest reserves and intervening territory. Flights to the northern points, on Baralzon and Nejanilini Lakes, were arranged through Arctic Wings Limited of Churchill. The plant collections made there are the first to be reported from the interior barren grounds of northern Manitoba, although the coastal area about Churchill is well known through the work of numerous botanists.

The writer was accompanied by Mr. W. K. W. Baldwin of the National Herbarium staff, who joins him in an expression of appreciation to Mr. Roy Bell, senior warden of the Turtle Mountain Forest Reserve, and Mr. Horace Flett, manager of the Hudson's Bay Company post at Nejanilini Lake, for information and help received during the course of work in those districts.

GEOLOGY AND TOPOGRAPHY

The southwestern part of Manitoba, north to the latitude of Dawson Bay, Lake Winnipegosis, which comprises about one tenth of the area of the province, is a region of elevations in general between 1,300 and 1,400 feet, underlain by Cretaceous shales, and is known as the "second prairie steppe." It is separated from the lower first prairie steppe to the east by the Manitoba Escarpment, a chain of hills and low mountains trending in a north-northwesterly direction. These are Pembina Mountain, Tiger Hills, Riding Mountain, Duck Mountain, and Porcupine Mountain, with a continuation into central eastern Saskatchewan known as the Pasquia Hills.

Much of the first prairie steppe is characterized by a flat, smooth topography, the result of deposition of silts and clays in glacial Lake Agassiz, which formerly covered the entire area. Outcrops of bedrock include those of the Precambrian formations east of Lake Winnipeg, the Ordovician, Silurian, and Devonian limestones and dolomites of the Interlake and West-lake districts, and the Cretaceous shales of the sharply sloping eastern flank of the Manitoba Escarpment. Many Lake Agassiz beaches, in the form of rounded gravel ridges or wave-cut terraces with a present gradual upward tilt towards the north, may be traced along the escarpment, except where interrupted by the wide valleys of the Assiniboine, Valley, Swan, and Red Deer Rivers. Some were formed when the lake drained towards the south, and others when the northeastward

drainage system into Hudson Bay was established, following the melting of the northern ice-front barrier. The entire length of the escarpment is indented with ravines cut deeply into the shale, from which weathered shale and shale clay have been eroded and deposited over the lower plain.

The second steppe may be divided into three main topographical areas, related to altitude. The basin of glacial Lake Souris, below the 1,550-foot contour, presents a smooth, almost level, topography except at a few places where sand dunes have been formed, as in the vicinity of Grande Clarière. This glacial lake, the first to be formed in Manitoba as the Pleistocene ice-sheet withdrew, originally drained southward by way of the lower levels of that part of the present Souris Basin west of Turtle Mountain but, upon the recession of the ice front from the Tiger Hills morainic area northeast of this mountain, drained eastward into youthful Lake Agassiz by way of the present Pembina River channel.

North and south of the Souris Basin, between the 1,550-foot and 1,900-foot contours of the region between Riding Mountain and Turtle Mountain, lie extensive areas of boulder till plain, varying from smoothly to roughly undulating, and with occasional terminal moraines.

Above the 1,900-foot contour in the Manitoba Escarpment, on a roughly undulating and more or less morainic, hilly terrain, a local, cooler, and more humid climate favours abundant forest growth. Here is found the highest elevation in Manitoba, a summit of Duck Mountain known as Baldy Mountain, reaching 2,727 feet above sea-level. The highest elevations of Riding and Porcupine Mountains lie somewhat above the 2,300-foot and 2,400-foot contours, respectively.

Due to intense erosion, the only remaining formations of Tertiary age in Manitoba are in Turtle Mountain, which reaches an elevation somewhat above the 2,450-foot contour and may be regarded as an outlier of the much more extensive Tertiary deposits of southern Saskatchewan, of which the Missouri Coteau, Wood Mountain, and Cypress Hills are prominent landscape features of the third or western prairie steppe. The surface of Turtle Mountain is wooded, although extensive meadows and poorly drained swampy areas occur throughout the morainic terrain.

The Baralzon-Nejanilini Lake area lies in the Precambrian Shield within the small section of arctic tundra which occupies the northeastern corner of Manitoba. The level, poorly drained country is dotted with lakes and ponds bordered by areas of muskeg, with typical barren ground terrain on the higher levels and isolated hillocks and ridges. Frost polygons are a characteristic feature of these higher, drier levels, and were found to possess a more or less distinctive flora. Small, isolated stands of dwarfed black spruce and tamarack occur at the Baralzon Lake station, these becoming more extensive and of more favoured growth around Nejanilini Lake.

CLIMATE

Tables I and II have been compiled from Volume I of "Climatic Summaries for Selected Meteorological Stations in the Dominion of Canada," with the exception of the figures for southwestern Manitoba, which have been taken from Ellis and Shafer (1940). Those of Table I

for this region are the averages of readings taken at Pierson, Souris, Waskada, and Deloraine from the years 1915 to 1937. Those of Table II are from readings at the same stations from 1883 to 1937, averaged with records from Pipestone, Hartney, and Melita. Dauphin is situated close to the northern edge of Riding Mountain, and Swan River lies between Duck and Porcupine Mountains. Figures for Winnipeg and The Pas are included for purposes of comparison. The Churchill records are the closest available for the Baralzon-Nejanilini Lake area.

It is evident from Tables I and II that figures for temperature and precipitation alone are of little value in explaining the totally different types of vegetation found in the southern prairie region and on the heights of the escarpment to the north. Annual precipitation is doubtless the

TABLE I
Monthly and Annual Averages of Daily Mean Temperature
(degrees Fahrenheit)

	Winnipeg	SW. Man.	Dauphin	Swan R.	The Pas	Churchill
Yrs. Obs.....	66	23	30	11	27	30
January.....	-3	0	0	-6	-9	-19
February.....	2	6	6	-6	-2	-17
March.....	16	20	19	9	11	-6
April.....	38	38	38	39	33	14
May.....	52	52	51	49	48	30
June.....	62	61	62	59	59	43
July.....	67	67	67	64	65	54
August.....	64	65	64	61	61	52
September.....	54	54	54	51	49	42
October.....	41	40	42	38	35	27
November.....	22	23	25	18	17	6
December.....	6	6	9	2	1	-11
Yearly Mean.....	35	36	36	31	31	18

principal climatic factor affecting plant growth in this region, although its range of fluctuation from year to year is of prime importance. Ellis and Shafer (l.c.) point out that the annual precipitation in southwestern Manitoba varies in different years from 10.24 to 27.87 inches. They state that "The average precipitation figure of 17.6 inches for the twelve months does not express the general moisture conditions. The precipitation during the years 1883 to 1937 is better expressed by stating that with the exception of four years with very high rainfall . . . the yearly rainfall varies from 10 to 21 inches. Years with low rainfall may be expected more frequently than years with high rainfall, but the occasional years of very high rainfall raise the yearly average and tend to mask the actual conditions." Their figures also indicate that atmospheric drought throughout the growing season for crops is a fairly frequent regional problem.

TABLE II
Average Monthly and Annual Precipitation
(in inches)

—	Winnipeg	SW. Man.	Dauphin	Swan R.	The Pas	Churchill
Yrs. Obs.....	66	55	30	11	27	30
January.....	0.92	0.88	0.91	0.63	0.61	0.48
February.....	0.86	0.73	0.61	0.65	0.50	0.61
March.....	1.19	0.95	0.84	1.14	0.72	0.87
April.....	1.37	1.17	0.73	0.79	0.81	0.89
May.....	2.26	1.76	1.70	1.52	1.38	0.93
June.....	3.15	3.15	2.70	3.41	2.20	1.85
July.....	3.08	2.40	2.42	2.80	2.22	2.19
August.....	2.45	2.33	1.95	2.27	2.11	2.69
September.....	2.35	1.57	1.88	1.78	1.96	2.33
October.....	1.49	1.11	1.15	0.82	1.16	1.43
November.....	1.12	0.88	0.99	1.13	0.98	1.03
December.....	0.95	0.79	0.68	0.98	0.79	0.66
Yearly Mean.....	21.19	17.63	16.56	17.92	15.44	15.96

Connor (1939) points out that for the region south of Riding Mountain and west of Souris River there is the greatest undependability of precipitation, where summer rainfall is as likely to be only half the normal amount as one and one half the normal amount. From meteorological records of various stations throughout the Canadian prairies, Clarke, Campbell, and Campbell (1942) note that, over a period of years, about one half of the annual precipitation occurs during the months of April to July inclusive, but that in extreme years 14 to 80 per cent may occur in this critical period. High summer temperatures, warm dry winds, and relatively low precipitation of varying seasonal distribution, fluctuating widely from year to year, undoubtedly make soil moisture the limiting factor for plant growth in the prairie region.

In those parts of the prairie where the water table is relatively high, as around poorly drained depressions or along the margins of streams and rivers, groves of aspen and poplar form a welcome addition to the landscape. The continuous tree cover of Turtle Mountain and of the Manitoba Escarpment above the 1,900-foot contour indicates a more humid climate than that of the adjacent lowlands.

Attention should be directed to the relationship between precipitation, temperature, and evaporation. A map published by Transeau in 1905 places the southwestern prairie region of Manitoba within a zone in which the ratio of annual rainfall to annual evaporation ranges from 60 to 80 per cent, in contrast to ratios of 80 to 130 per cent for the remaining southern parts of the province. A closer correlation between climatic zones and observed biotic provinces has been derived by Thornthwaite (1931), who divided North America into five zones of "precipitation effectiveness," these being further subdivided according to their "temperature efficiency" and seasonal distribution of precipitation, until thirty-two climatic provinces had been recognized. Thornthwaite's formula allows an evaluation of the effectiveness of precipitation at any station which possesses monthly records of precipitation and temperature, the derived index being a close approximation to ten times the sum of the monthly ratios of precipitation to evaporation which would have been obtained had evaporation data been available.

Thornthwaite places the extreme southwestern corner of Manitoba in his DC'd category, denoting a semiarid microthermal climate with rainfall deficient at all seasons. In contrast, a large part of southern Manitoba north to Porcupine Mountain and east to the east coast of Lake Winnipeg is classed as sub-humid. On the basis of P-E and T-E indices of 42.2 and 38.3, respectively, Ellis (1938; Figs. 11 and 12, and Table I) has also classed the southwestern prairie corner as sub-humid. Actually, in view of the foregoing discussion of the wide annual and seasonal fluctuations in rainfall in this area, it is apparent that the climate in different years may range between semiarid and sub-humid, with deficient to abundant moisture during the critical period of growth.

The Baralzon-Nejanilini Lake area lies within Thornthwaite's tundra province, characterized by an inadequate temperature efficiency, so that temperature, and not precipitation, becomes the limiting factor for plant growth.

VEGETATION OF THE SOURIS BASIN PRAIRIE

Comparatively little native prairie remains in Manitoba, although a few unbroken tracts may still be found whose study furnishes an approximate picture of the original vegetation. The present locality lies to the north of Turtle Mountain in the Souris Basin landscape area, about 8 miles north of the town of Minto or 22 miles southwest of Brandon. It lies at an elevation of between 1,400 and 1,450 feet above sea-level on a south-facing slope of the Hartney Plain overlooking the Heaslip Terrace of the Souris River.

Plate XXIII shows the heavily wooded valley of Souris River, the adjoining Heaslip Terrace, and the Hartney Plain slope in the background. The characteristic absence of trees on exposed, well-drained upland sites reflects the adverse influence of low precipitation effectiveness, although the extremely tough nature of the thick prairie sod is undoubtedly also a major barrier to the establishment of tree seedlings. The well-established and extensive root systems of the prairie species, which thoroughly occupy the soil in several more or less distinct strata from a level immediately below the surface, greatly reduce the chances for survival of tree seedlings, which must also withstand the extremely severe conditions of the first winter's exposure. These factors may largely explain the scarcity of annuals in the prairie flora, as well as of weeds, except in disturbed areas. The photograph illustrates the fact that breaking of the prairie turf by erosion may allow the development of a tree or shrub vegetation in sheltered ravines or coulées.

PLATE XXIII



Souris River valley north of Minto, showing the heavily wooded river banks, the adjacent Heaslip Terrace, and the Hartney Plain prairie slope in the background.

The following plants were collected in the prairie habitat: *Koeleria cristata*, *Carex filifolia*, *Allium textile*, *Smilacina stellata*, *Sisyrinchium campestre*, *Comandra pallida*, *Chenopodium album*, *Axyris amaranthoides*, *Cerastium arvense*, *Anemone patens* var. *Wolfgangiana*, *Lesquerella ludoviciana*, *Draba nemorosa* var. *lejocarpa*, *Erysimum asperum*, *Arabis Holboellii* var. *retrofracta*, *Lepidium densiflorum*, *Heuchera Richardsonii*, *Potentilla concinna*, *Spiraea alba*, *Astragalus caryocarpus*, *A. goniatus*, *A. flexuosus*, *Vicia americana* var. *truncata*, *Psoralea esculenta*, *Oxytropis albertina*, *O. Lambertii*, *Lathyrus palustris*, *Linum Lewisii*, *Viola pedatifida*, *V. Nuttallii*, *Elaeagnus commutata*, *Gaura coccinea*, *Zizia aurea*, *Lomatium orientale*, *Apocynum androsaemifolium*, *Androsace occidentalis*, *Phlox Hoodii*, *Ellisia nyctelea*, *Lithospermum canescens*, *Dracocephalum parviflorum*, *Penstemon albidus*, *Castilleja sessiliflora*, *Galium boreale*, *Symphoricarpos occidentalis*, *Campanula rotundifolia*, *Senecio integerrimus*, *S. canus*, *S. plattensis*, *Erigeron elatus*, *Artemisia frigida*, *A. ludoviciana* var. *gnaphalodes*, *A. camporum*, *Agoseris glauca*, *A. cuspidata*, *Antennaria aprica*, *Solidago juncea*, *Achillea lanulosa*, *Taraxacum erythrospermum*, and *Helianthus laetiflorus* var. *rigidus*.

Various theories have at one time or another been advanced to account for the treelessness of the prairies. These have been discussed by Shimek (1911), Sampson (1921), and other ecologists, who are of the opinion, in general, that under present climatic conditions woodland and treeless prairie are in a state of balanced tension, one or the other holding the ground in conformity with climatic cycles of varying duration.

There appears to be no consistent correlation between local prairie communities and local soil types, except to the extent that the plants themselves have contributed to soil differentiation. Where both forest and prairie vegetation have developed on the original glacial till, the soil under the latter is more fertile by reason of the influence of the prairie vegetation itself and of the more arid climate to which the prairie species are adapted. In the forest, humus accumulates and mostly decays on the soil surface, whereas the numerous roots and rootstocks of prairie species add humus more generally throughout the soil profile, with consequent improvement in water-retaining properties, soil aeration, soil temperature, content of nitrogen-fixing bacteria and fungi, and ease of root penetration. Thornthwaite (l.c.) states that the precipitation-effectiveness index of 48 separates the lime-accumulating, pedacolic soils, characteristic of prairie regions, from the acid, podsolic soils in which leaching has occurred more rapidly owing to a greater ratio of precipitation to evaporation.

The arid nature of the upland prairie habitat finds expression in various xerophytic adaptations of the plants, and in the fact that the vegetation of neighbouring sand-dune areas is very similar in species, as will be borne out by a following listing of the species of the Souris Basin dune area near Grande Clarière. The almost complete occupation of the various soil levels by the root systems of different species has already been noted. This points to a fine adjustment between species, so that considerable changes in their relative abundance are unlikely. Species such as June grass (*Koeleria cristata*), with a shallow, wide-spreading root system, are able to use the moisture of the many light showers whose water does not soak in deeply, while deep-rooted species,

such as ground-plum (*Astragalus caryocarpus*) and Indian turnip (*Psoralea esculenta*), can reach the more reliable water supply of greater depths. The enlarged root of the latter also serves as an organ of water storage, as does the stem of the cactus (*Mamillaria vivipara*) of the sand-dune habitat. Low stature, with attendant decrease of exposure to drying winds, is characteristic, few upland species exceeding a height of one foot. Species having small or narrow leaves are common, the lower leaves often being shed during periods of drought. The leaves are often leathery in texture and in some species, as the sages (*Artemisia*) and silverberry (*Elaeagnus commutata*), are covered by protecting trichomes.

The following species were collected on a road-bank below the prairie habitat: *Panicum Leibergii*, *Carex saximontana*, *Camelina microcarpa*, *Arctostaphylos Uva-ursi*, *Agastache Foeniculum*, and *Dracocephalum parviflorum*.

The damp, wooded shore of the Souris River below the prairie site had the following vegetation: *Equisetum arvense*, *Poa palustris*, *P. pratensis*, *Bromus latiglumis*, *Carex Sprengelii*, *Smilax lasioneura*, *Salix interior*, *Urtica gracilis*, *Laportea canadensis*, *Humulus Lupulus*, *Ulmus americana*, *Rumex fenestratus*, *Cerastium nutans*, *Thalictrum polygamum*, *Ranunculus sceleratus*, *Anemone canadensis*, *Corydalis aurea*, *Erysimum cheiranthoides*, *Capsella Bursa-pastoris*, *Cardamine pensylvanica*, *Descurainia Sophia*, *Thlaspi arvense*, *Ribes americanum*, *Potentilla anserina*, *Rosa acicularis*, *Prunus virginiana*, *Trifolium pratense*, *Acer Negundo*, *Viola rugulosa*, *Cornus stolonifera*, *Fraxinus pensylvanica* var. *subintegerrima*, *Ellisia nyctelea*, *Mentha arvensis* var. *villosa* f. *glabrata*, *Stachys palustris* var. *pilosa*, *Plantago major*, *Galium boreale*, *Symphoricarpos occidentalis*, *Echinocystis lobata*, *Taraxacum officinale*, *Erigeron philadelphicus*, *Artemisia biennis*, *Sonchus arvensis* var. *glabrescens*, *Aster* sp., and *Xanthium* sp.

VEGETATION OF THE GRANDE CLARIÈRE SAND-DUNE AREA

The Grande Clarière district lies in the Souris Basin in an intermittently wooded sand-dune region about 45 miles southwest of Brandon. The relatively heavily wooded part covers about half of a fifteen-square-mile area west of the town of Hartney (see Turtle Mountain sheet, Sectional Map No. 21, Canada) and may be considered to be a somewhat disconnected southern outlier of the aspen parkland which forms a region of transition between the southern prairie and the northern conifer forest. The approximate extent of the parkland is indicated by Bird (1930, Fig. 1), who is of the opinion that, under present climatic conditions, it is slowly replacing the prairie in the south and is itself being replaced by spruce along its northern front. It is generally believed that, following migration of the conifer forest northward, possibly during a postglacial xerothermic period, aspen groves remained in moist and sheltered positions along the southern front, while prairie invaded the drier areas. It is interesting to note the occurrence of a relict spruce community in the Spruce Woods Forest Reserve south of Brandon, where isolated thickets and clumps of white spruce (*Picea glauca*), associated with creeping juniper (*Juniperus horizontalis*), are found scattered throughout an area of typical prairie vegetation.



Sand-dune area of the Souris Basin near Grande Clarière.

The nature of the sand-dune vegetation cover is shown in Plate XXIV, stands of aspen (*Populus tremuloides*), poplar (*P. balsamifera*), bur oak (*Quercus macrocarpa*), and Bebb's willow (*Salix Bebbiana*) being interspersed with higher, drier, sandy areas with a xerophytic vegetation closely related to that of the Souris prairie region described above. Sand originating from glacial Lake Souris has been here blown into low dunes, but the presence of buried soils in some parts indicates that some of the dune formation occurred at a relatively recent date, perhaps following deterioration of the plant cover during periods of severe drought (Ellis and Shafer, 1940).

It seems probable that the tree species established themselves in the dune area following stabilization and enrichment of the sand by prairie species before this final disruption of the prairie community, to which shading by trees may have been a hastening factor. Breaking of the prairie sod by erosion in many places throughout the rolling terrain, or the predominance of the more open bunch-grass type of vegetation, presumably opened the way to invasion by forest species, initiating the final stage in the succession. Once established, perhaps during an especially favourable succession of moist years, soil moisture conditions would be the critical factor for continued survival. Tongues of forest stretch throughout the prairies along the margins of rivers and streams. The supply of moisture on the dunes is less reliable, but evidently not to the degree that scrub stands of aspen, poplar, and bur oak cannot maintain themselves. Low sand-dunes generally contain considerable amounts of moisture a few inches below the surface, and this moisture is more available than that of fine-grained soils. The sand loses water readily from

the surface, but this is compensated for to a large extent by the mulching effect of the dry surface layer. The trees further reduce surface evaporation by their shade and accumulated litter and tend to stabilize the dunes, although aspen and poplar can withstand considerable burial of the trunk by sand.

The following species were collected on the dry, sandy dune area: *Selaginella densa*, *Equisetum hyemale* var. *intermedium*, *Juniperus horizontalis*, *Koeleria cristata*, *Panicum Wilcoxianum*, *Bouteloua gracilis*, *Poa compressa*, *Carex (siccata) foenea*, *C. filifolia*, *C. heliophila*, *Smilax lasioneura*, *Smilacina stellata*, *Sisyrinchium campestre*, *Hypoxis hirsuta*, *Populus tremuloides*, *P. balsamifera*, *Salix Bebbiana*, *Quercus macrocarpa*, *Comandra Richardsiana*, *Cerastium arvense*, *Anemone cylindrica*, *A. multifida*, *A. patens* var. *Wolfgangiana*, *Erysimum asperum*, *Arabis divaricarpa*, *A. Holboellii* var. *retrofracta*, *Lepidium densiflorum*, *Rosa* sp., *Potentilla arguta*, *P. pensylvanica* var. *bipinnatifida*, *Prunus virginiana*, *P. pensylvanica*, *Geum triflorum*, *Fragaria virginiana*, *Amelanchier alnifolia*, *Petalostemum purpureum*, *Oxytropis albertina*, *O. Lambertii*, *Lathyrus ochroleucus*, *Rhus radicans* var. *Rydbergii*, *Viola adunca*, *Mamillaria vivipara*, *Elaeagnus commutata*, *Zizia aptera*, *Arctostaphylos Uva-ursi* var. *coactilis*, *Dodecatheon Meadia*, *Androsace occidentalis*, *Asclepias viridiflora* var. *linearis*, *A. ovalifolia*, *Lithospermum canescens*, *L. incisum*, *Oenothera serrulata*, *Penstemon albidus*, *Artemisia frigida*, *A. ludoviciana* var. *gnaphalodes*, *A. camporum*, *Antennaria aprica*, *Erigeron elatus*, *Helianthus laetiflorus* var. *rigidus*, and *Senecio canus*.

The following additional species were noted by Ellis and Shafer (1940) for the Souris Basin sand-dune area: *Betula pumila* var. *glandulifera*, *Juniperus communis*, *Andropogon Gerardi*, *Stipa spartea*, *Calamovilfa longifolia*, *Heuchera* sp., *Galium boreale*, *Opuntia polyacantha*, *Phlox Hoodii*, and *Aralia hispida*.

VEGETATION OF THE TURTLE MOUNTAIN AREA

Turtle Mountain, a southern outlier of the aspen parkland, straddles the forty-ninth parallel in southwestern Manitoba. It covers an area of over 100 square miles, of which the main part is in Canada. Climatic and soil conditions have favoured the development of an unusually luxuriant vegetation, of which the dominant tree members are aspen (*Populus tremuloides*), poplar (*P. balsamifera*), bur oak (*Quercus macrocarpa*), paper birch (*Betula papyrifera*), green ash (*Fraxinus pensylvanica* var. *subintegerrima*), Manitoba maple (*Acer Negundo* var. *interius*), and American elm (*Ulmus americana*).

Secondary species of the aspen-oak open grove habitat include *Botrychium virginianum*, *Equisetum pratense*, *Elymus canadensis*, *E. virginicus*, *Oryzopsis asperifolia*, *Carex bromoides*, *C. pensylvanica*, *C. rosea*, *Maianthemum canadense* var. *interius*, *Smilacina stellata*, *Smilax lasioneura*, *Streptopus roseus*, *Trillium cernuum*, *Habenaria viridis* var. *interjecta*, *Salix Bebbiana*, *S. discolor*, *S. gracilis*, *S. pedicellaris* var. *hypoglauca*, *Alnus rugosa* var. *americana*, *Corylus cornuta*, *C. americana*, *Humulus Lupulus*, *Arenaria lateriflora*, *Stellaria calycantha* var. *isophylla*, *Actaea rubra*, *Anemone canadensis*, *Thalictrum dasycarpum*, *Ribes americanum*, *R. glandulosum*, *R. hirtellum* var. *calcicola*, *R. oxyacanthoides*, *R. triste*,

Amelanchier alnifolia, *Fragaria vesca* var. *americana*, *Prunus pensylvanica*, *P. virginiana*, *Rosa acicularis*, *Rubus pubescens*, *R. idaeus* var. *strigosus*, *Astragalus canadensis*, *Lathyrus ochroleucus*, *L. venosus* var. *intonsus*, *Vicia americana*, *Parthenocissus inserta*, *Viola pubescens*, *V. rugulosa*, *Shepherdia canadensis*, *Aralia nudicaulis*, *Osmorhiza longistylis*, *Sanicula marilandica*, *Cornus canadensis*, *C. stolonifera* var. *Baileyi*, *Pyrola asarifolia*, *P. elliptica*, *Lysimachia ciliata*, *Galium boreale*, *G. triflorum*, *Lonicera dioica* var. *glaucescens*, *Symphoricarpos albus*, *S. occidentalis*, *Viburnum edule*, *V. Lentago*, *V. trilobum*, *Achillea sibirica*, *Aster macrophyllus*, *A. umbellatus* var. *pubens*, *Petasites sagittatus*, *Prenanthes alba*, *Rudbeckia laciniata*, and *Solidago canadensis*.

Lemna minor, *L. trisulca*, *Ceratophyllum demersum*, and *Utricularia vulgaris* were collected in shallow water near the shore of Max Lake.

In the prairie region along the northern flank of Turtle Mountain grew *Carex filifolia*, *C. heliophila*, *C. stenophylla* var. *enervis*, *Allium textile*, *Polygonum Convolvulus*, *Monolepis Nuttalliana*, *Cerastium arvense*, *Anemone patens* var. *Wolfgangiana*, *Brassica Kaber* var. *pinnatifida*, *Lesquerella ludoviciana*, *Draba nemorosa* var. *lejocarpa*, *Descurainia Richardsonii*, *Potentilla norvegica*, *Geum triflorum*, *Psoralea esculenta*, *Vicia americana* var. *angustifolia*, *Viola pedatifida*, *Androsace occidentalis*, *Phlox Hoodii*, *Lithospermum canescens*, *Monarda fistulosa* var. *mollis*, *Penstemon albidus*, *Helianthus laetiflorus* var. *rigidus*, *Artemisia frigida*, *Senecio canus*, and *Antennaria aprica*.

VEGETATION OF RIDING, DUCK, AND PORCUPINE MOUNTAINS

These three low mountains form the southeastern boundary of the Mixedwood Section of the transcontinental boreal forest region (see Halliday, 1937, with map). Notwithstanding the complex history of the district with respect to fire, Halliday (1932) was able to distinguish four main forest site groups on Riding Mountain, namely, meso-hygrophile, mesophile (transition), mesophile, and hydrophile, each with its own characteristic representation and abundance of trees, shrubs, and herbaceous ground cover.

Halliday notes a fairly definite relation between parent soils and forest groups on Riding Mountain. The meso-hygrophile group, confined to the heavier textured, clayey, glacial till and morainic deposits, and the upper slopes of clay loam to loam morainic deposits, is characterized by dominance of aspen and white spruce, with some admixture of paper birch, poplar, and balsam fir. The lower vegetation is dominated by hazelnut (*Corylus cornuta*) and wild sarsaparilla (*Aralia nudicaulis*), with rose (*Rosa acicularis*), squashberry (*Viburnum edule*), tall lungwort (*Mertensia paniculata*), aster (*Aster ciliolatus*), bunchberry (*Cornus canadensis*), strawberry (*Fragaria vesca* var. *americana*), dwarf raspberry (*Rubus pubescens*), hairy wild rye (*Elymus innovatus*), and mountain-rice (*Oryzopsis asperifolia*) as subdominants. Mosses are few in number and of irregular distribution. Pure aspen stands occur on the tops and upper slopes of the terrain.

The mesophile (transition) group is confined, in general, to lower slopes than the above. White spruce shows an increased abundance, while

aspen, hazelnut, squashberry, and wild sarsaparilla show a decrease. Twin-flower (*Linnaea borealis* var. *americana*) is a characteristic cover species, together with an increased number and density of mosses.

The mesophile forest sites, dominated by black spruce (*Picea mariana*) on heavy to light textured morainic slopes and lower levels, and by jack pine (*Pinus Banksiana*) on the higher, light textured, sandy or gravelly loams, have speckled alder (*Alnus rugosa* var. *americana*), blueberry (*Vaccinium myrtilloides*), raspberry (*Rubus idaeus* var. *strigosus*), rock-cranberry (*Vaccinium Vitis-Idaea* var. *minus*), bunchberry, hairy wild rye, and bristly club-moss (*Lycopodium annotinum*) as characteristic cover species, with an increased density of mosses and a marked falling off of other species of the transition group.

The hydrophile forest is confined to the poorly drained, organic muck soils of muskeg areas and is dominated by black spruce, with Labrador tea (*Ledum groenlandicum*), rock-cranberry, baked-apple-berry (*Rubus Chamaemorus*), and sphagnum moss as characteristic cover species, other herbs noted above being typically absent from this highly acidic habitat.

In contrast to the pedacolic soils of the neighbouring plains, greater leaching in the more humid upland climate has favoured the development of acid podsolie soils. Halliday points out the evident occurrence of islands or tongues of modified lowland soils intruded into the lower levels of the upland region, allowing the interesting conjecture that "a large part of the Riding Mountains was at one time grassland and continued invasion or degradation by forest conditions is taking place with increase in the numbers and range of conifers."

The following species were collected in an open aspen-white spruce woods by Moon Lake, Riding Mountain: *Cystopteris fragilis*, *Athyrium Filix-femina* var. *Michauxii*, *Pteretis pensylvanica*, *Equisetum sylvaticum* var. *pauciramosum*, *E. arvense* var. *boreale*, *E. pratense*, *E. scirpoides*, *Picea glauca*, *Pinus Banksiana*, *Elymus innovatus*, *Glyceria striata* var. *stricta*, *Schizachne purpurascens*, *Oryzopsis asperifolia*, *Carex Peckii*, *C. Sprengelii*, *C. concinna*, *C. aurea*, *C. capillaris* var. *major*, *Luzula acuminata*, *Smilacina stellata*, *Trillium cernuum*, *Maianthemum canadense* var. *interius*, *Orchis rotundifolia*, *Corallorhiza trifida*, *Populus tremuloides*, *P. balsamifera*, *Salix lutea*, *S. planifolia*, *S. Bebbiana*, *S. gracilis*, *Alnus rugosa* var. *americana*, *Betula papyrifera*, *Urtica gracilis*, *Rumex obtusifolius*, *Stellaria longipes*, *Arenaria lateriflora*, *Anemone quinquefolia* var. *interior*, *A. canadensis*, *Caltha palustris*, *Actaea rubra*, *Thalictrum polygamum*, *Chrysosplenium ioense*, *Ribes glandulosum*, *R. hudsonianum*, *R. americanum*, *R. hirtellum*, *R. triste*, *Mitella nuda*, *Geum triflorum*, *G. rivale*, *Prunus pensylvanica*, *P. virginiana*, *Rosa acicularis*, *Rubus idaeus* var. *strigosus*, *R. pubescens*, *Lathyrus ochroleucus*, *Astragalus goniatus*, *Oxytropis retrorsa* var. *sericea*, *Acer spicatum*, *Rhamnus alnifolia*, *Viola palustris*, *V. rugulosa*, *V. pubescens*, *Shepherdia canadensis*, *Epilobium angustifolium*, *Aralia nudicaulis*, *Heracleum lanatum*, *Sanicula marilandica*, *Cornus stolonifera* var. *Baileyi*, *C. canadensis*, *Pyrola asarifolia* var. *purpurea*, *Apocynum androsaemifolium*, *Mertensia paniculata*, *Agastache Foeniculum*, *Galium triflorum*, *Linnaea borealis* var. *americana*, *Lonicera dioica* var. *glaucescens*, *L. involucrata*, *Viburnum edule*, *V. Lentago*, *V. trilobum*, *Symphoricarpos albus*, *Diervilla Lonicera*, *Antennaria campestris*, *Petasites palmatus*, *P. vitifolius*,

Solidago canadensis, and *Aster Lowrieanus*. In addition to the above, the following species are reported by Halliday from various of his forest sites on Riding Mountain: *Dryopteris cristata*, *D. spinulosa*, *Botrychium virginianum*, *B. Lunaria*, *Lycopodium annotinum*, *L. complanatum*, *Abies balsamea*, *Picea mariana*, *Larix laricina*, *Juniperus horizontalis*, *Elymus interruptus*, *Carex brunnescens*, *C. disperma*, *C. pensylvanica*, *Eriophorum callitrix*, *Lilium philadelphicum*, *Smilacina racemosa*, *S. trifolia*, *Corallorhiza maculata*, *C. striata*, *Goodyera repens* var. *ophioides*, *Habenaria obtusata*, *Salix serissima*, *Betula pumila* var. *glandulifera*, *Corylus cornuta*, *Geocaulon lividum*, *Actaea rubra* f. *neglecta*, *Thalictrum dioicum*, *Ribes lacustre*, *R. oxyacanthoides*, *Amelanchier alnifolia*, *Fragaria vesca* var. *americana*, *Pyrus scopulina*, *Potentilla fruticosa*, *Rubus Chamaemorus*, *Vicia americana*, *Celastrus scandens*, *Viola renifolia*, *Circaea alpina*, *Osmorhiza obtusa*, *Gaultheria hispidula*, *Moneses uniflora*, *Monotropa uniflora*, *Pyrola elliptica*, *P. minor*, *P. secunda*, *Andromeda Polifolia*, *Arctostaphylos Uva-ursi*, *Ledum groenlandicum*, *Oxycoccus palustris*, *Vaccinium Vitis-Idaea* var. *minus*, *V. myrtilloides*, *V. angustifolium* var. *laevifolium*, *Trientalis borealis*, *Galium boreale*, *Lonicera canadensis*, *Aster umbellatus* var. *pubens*, and *Prenanthes alba*.

Following is a list of plants collected in an aspen-white spruce woods near Singush Lake, Duck Mountain: *Botrychium virginianum*, *B. Lunaria*, *Equisetum arvense* var. *boreale*, *E. pratense*, *E. sylvaticum* var. *pauciramosum*, *E. scirpoides*, *Lycopodium annotinum*, *Abies balsamea*, *Pinus Banksiana*, *Larix laricina*, *Picea glauca*, *Oryzopsis asperifolia*, *Schizachne purpurascens*, *Elymus innovatus*, *Carex vaginata*, *C. media*, *C. disperma*, *C. Peckii*, *C. Rossii*, *Luzula acuminata*, *L. parviflora*, *Maianthemum canadense* var. *interius*, *Smilacina stellata*, *S. trifolia*, *Sisyrinchium montanum*, *Corallorhiza trifida*, *Habenaria viridis* var. *interjecta*, *Populus tremuloides*, *P. balsamifera*, *Salix Bebbiana*, *S. gracilis*, *S. candida*, *Betula papyrifera*, *Corylus cornuta*, *Alnus crispa*, *Comandra Richardsiana*, *Arenaria lateriflora*, *Stellaria longipes*, *Actaea rubra*, *Anemone canadensis*, *Caltha palustris*, *Arabis hirsuta* var. *pycnocarpa*, *Draba nemorosa* var. *lejocarpa*, *Cardamine pensylvanica*, *Ribes hirtellum*, *R. hudsonianum*, *R. lacustre*, *R. glandulosum*, *R. triste*, *R. americanum*, *Chrysosplenium ioense*, *Mitella nuda*, *Prunus virginiana*, *P. pensylvanica*, *Rosa acicularis*, *Rubus idaeus* var. *strigosus*, *R. Chamaemorus*, *R. acaulis*, *R. pubescens*, *Pyrus scopulina*, *Lathyrus ochroleucus*, *Vicia americana*, *Polygala Senega*, *Acer spicatum*, *Rhamnus alnifolia*, *Viola rugulosa*, *V. adunca*, *V. pallens*, *Shepherdia canadensis*, *Elaeagnus commutata*, *Epilobium angustifolium*, *Aralia nudicaulis*, *Heracleum lanatum*, *Sanicula marilandica*, *Cicuta maculata*, *Cornus canadensis*, *C. stolonifera* var. *Baileyi*, *Pyrola virens*, *Gaultheria hispidula*, *Arctostaphylos Uva-ursi*, *Ledum groenlandicum*, *Vaccinium Vitis-Idaea* var. *minus*, *Apocynum androsaemifolium*, *Mertensia paniculata*, *Stachys palustris* var. *pilosa*, *Galium boreale*, *G. triflorum*, *Adoxa Moschatellina*, *Symphoricarpos albus*, *Lonicera dioica* var. *glaucescens*, *Viburnum trilobum*, *V. edule*, *Linnaea borealis* var. *americana*, *Diervilla Lonicera*, *Valeriana septentrionalis*, *Petasites palmatus*, *P. vitifolius*, *P. sagittatus*, *Prenanthes altissima*, *Taraxacum officinale*, *Agoseris glauca*, *Solidago canadensis*, *Senecio pauperculus*, and *Achillea sibirica*.

An aspen-white spruce forest near the fire tower on Porcupine Mountain had the following composition: *Pteretis pensylvanica*, *Equisetum*

arvense f. *pseudo-silvaticum*, *Carex saximontana*, *Eriophorum opacum*, *Smilacina stellata*, *Orchis rotundifolia*, *Habenaria obtusata*, *Populus tremuloides*, *P. balsamifera*, *Salix Bebbiana*, *S. lucida*, *S. rigida*, *Corylus cornuta*, *Actaea rubra*, *Anemone canadensis*, *Thalictrum polygamum*, *Ribes oxycanthoides*, *R. hudsonianum*, *R. triste*, *Prunus pensylvanica*, *P. virginiana*, *Amelanchier alnifolia*, *Rubus pubescens*, *Vicia americana* var. *truncata*, *Lathyrus ochroleucus*, *Hedysarum alpinum* var. *americanum*, *Astragalus frigidus* var. *americanus*, *Acer Negundo*, *A. spicatum*, *Viola rugulosa*, *Shepherdia canadensis*, *Epilobium angustifolium*, *Aralia nudicaulis*, *Sanicula marilandica*, *Heracleum lanatum*, *Cornus stolonifera* var. *Baileyi*, *Lysimachia ciliata*, *Mertensia paniculata*, *Viburnum trilobum*, *V. edule*, *Linnaea borealis* var. *americana*, *Diervilla Lonicera*, *Lonicera dioica* var. *glaucescens*, *Symphoricarpos albus*, *Prenanthes altissima*, *Achillea sibirica*, *Solidago hispida* var. *lanata*, *S. canadensis*, *Petasites palmatus*, and *Eupatorium maculatum*.

The following species are of general distribution in disturbed areas and open clearings throughout the area: *Pteridium aquilinum* var. *latiusculum*, *Alopecurus aequalis*, *Agropyron trachycaulum* var. *unilaterale*, *A. trachycaulum* var. *glaucum*, *A. trachycaulum* var. *novae-angliae*, *Beckmannia Syzigachne*, *Bromus anomalus*, *B. ciliatus*, *Calamagrostis canadensis*, *Festuca rubra*, *F. saximontana*, *Glyceria grandis*, *G. striata* var. *stricta*, *Hierochloe odorata*, *Hordeum jubatum*, *Phleum pratense*, *Poa pratensis*, *P. annua*, *P. trivialis*, *Carex Bebbii*, *C. Deweyana*, *C. foenea*, *C. Peckii*, *C. saximontana*, *C. viridula*, *Urtica dioica*, *U. gracilis*, *Polygonum achoreum*, *P. Convolvulus*, *P. erectum*, *Rumex fenestratus*, *Axyris amaranthoides*, *Chenopodium album*, *C. capitatum*, *C. hybridum* var. *gigantospermum*, *Amaranthus retroflexus*, *Cerastium arvense*, *C. nutans*, *Stellaria longifolia*, *S. longipes*, *Anemone cylindrica*, *A. multifida*, *Aquilegia canadensis*, *Ranunculus Macounii*, *R. pensylvanicus*, *Corydalis aurea*, *Arabis divaricarpa*, *A. Drummondii*, *A. hirsuta* var. *pycnocarpa*, *Brassica Kaber* var. *pinnatifida*, *Capsella Bursa-pastoris*, *Cardamine pensylvanica*, *Descurainia Sophia*, *Draba nemorosa* var. *lejocarpa*, *Erysimum cheiranthoides*, *Lepidium densiflorum*, *Neslia paniculata*, *Thlaspi arvense*, *Geum macrophyllum*, *G. rivale*, *G. triflorum*, *Potentilla norvegica*, *Astragalus alpinus*, *A. striatus*, *A. tenellus*, *Hedysarum alpinum* var. *americanum*, *Medicago lupulina*, *Melilotus officinalis*, *Oxytropis retrorsa* var. *sericea*, *O. splendens*, *Trifolium pratense*, *Geranium Bicknellii*, *Polygala Senega*, *Rhus radicans* var. *Rydbergii*, *Impatiens capensis*, *I. pallida*, *Epilobium angustifolium*, *E. glandulosum* var. *adenocaulon*, *Oenothera biennis*, *Carum Carvi*, *Heracleum lanatum*, *Zizia aptera*, *Vaccinium cespitosum*, *Apocynum androsaemifolium*, *Convolvulus sepium*, *Collomia linearis*, *Ellisia nyctelea*, *Phacelia Franklinii*, *Lappula echinata*, *Lithospermum canescens*, *L. incisum*, *Symphytum officinale*, *Agastache Foeniculum*, *Dracocephalum parviflorum*, *Galeopsis Tetrahit* var. *bifida*, *Monarda fistulosa* var. *mollis*, *Nepeta Cataria*, *Stachys palustris* var. *pilosa*, *Chamaesaracha grandiflora*, *Castilleja rhexifolia*, *Plantago major*, *Galium boreale*, *Campanula rotundifolia*, *Achillea lanulosa*, *Agoseris glauca*, *Antennaria campestris*, *A. nitida*, *Anthemis Cotula*, *Artemisia Absinthium*, *A. ludoviciana* var. *gnaphalodes*, *A. ludoviciana* var. *latifolia*, *Cirsium arvense*, *Crepis tectorum*, *Erigeron elatus*, *E. canadensis*, *E. philadelphicus*, *Hieracium canadense*, *Matricaria matricarioides*, *Senecio aureus*, *S. densus*, *S. pauperculus*, *Solidago canadensis*, *S. graminifolia* var. *media*, *S. hispida*, *S. hispida* var. *lanata*, *Sonchus arvensis* var. *glabrescens*, and *Taraxacum officinale*.

Following are lists of species collected in various habitats:

Wet sedge meadow on Riding Mountain, 6 miles south of Moon Lake: *Equisetum fluviatile*, *Larix laricina*, *Carex atherodes*, *C. lanuginosa*, *C. rostrata* var. *utriculata*, *C. vaginata*, *Eleocharis palustris*, *Scirpus validus* var. *creber*, *Salix gracilis*, *S. myrtillifolia*, *S. pedicellaris* var. *hypoglauca*, *S. Bebbiana*, *S. discolor*, *S. planifolia*, *S. candida*, *Betula glandulosa*, *Polygonum amphibium* var. *stipulaceum*, *Rumex fenestratus*, *Arenaria lateriflora*, *Stellaria longifolia*, *Ranunculus Purshii*, *Ribes oxyacanthoides*, *R. hudsonianum*, *Potentilla norvegica*, *P. palustris*, *Rubus pubescens*, *R. acaulis*, *Geum rivale*, *Lathyrus palustris*, *Viola cucullata*, *Epilobium palustre*, *Hippuris vulgaris*, *Sium suave*, *Lysimachia thyrsiflora*, *Mentha arvensis* var. *villosa* f. *glabrata*, *Galium trifidum*, *Cirsium* sp., *Petasites sagittatus*, *Aster ciliolatus*, and *A. puniceus*.

Gravel floodplain of stream draining north slope of Riding Mountain: *Phleum pratense*, *Glyceria striata* var. *stricta*, *Poa palustris*, *Carex Deweyana*, *C. Houghtonii*, *C. Peckii*, *C. saximontana*, *Cerastium nutans*, *Ranunculus abortivus* var. *acrolasius*, *Cardamine pensylvanica*, *Astragalus canadensis*, *A. tenellus*, *Veronica americana*, and *Crepis tectorum*.

Marsh at foot of Duck Mountain: *Equisetum palustre*, *Triglochin maritima*, *Alisma triviale*, *Beckmannia Syzigachne*, *Glyceria striata* var. *stricta*, *Carex lanuginosa*, *Eriophorum angustifolium*, *Acorus Calamus*, *Juncus nodosus*, *Ranunculus pensylvanicus*, *R. Cymbalaria*, *Lysimachia thyrsiflora*, *Veronica scutellata* var. *villosa*, and *Galium trifidum*.

Low, wet border of pond, Duck Mountain: *Equisetum fluviatile* f. *Linnaeanum*, *Typha latifolia*, *Glyceria borealis*, *G. grandis*, *Beckmannia Syzigachne*, *Alopecurus aequalis*, *Poa palustris*, *Carex diandra*, *C. rostrata* var. *utriculata*, *Salix pedicellaris* var. *hypoglauca*, *Polygonum amphibium* var. *stipulaceum*, *P. amphibium* var. *stipulaceum* f. *fluitans*, *Ranunculus pensylvanicus*, *Cardamine pensylvanica*, *Rorippa islandica* var. *Fernaldiana*, *Potentilla anserina*, *P. palustris*, *Epilobium glandulosum* var. *adenocaulon*, *Sium suave*, *Lysimachia thyrsiflora*, *Menyanthes trifoliata*, *Mentha arvensis* var. *villosa* f. *glabrata*, *Stachys palustris* var. *pilosa*, *Veronica scutellata* var. *villosa*, and *Galium trifidum*.

Shallow water of pond, Duck Mountain: *Potamogeton natans*, *Ranunculus Purshii*, *R. aquatilis* var. *capillaceus*, and *Callitriche palustris*.

Shallow water of Singush Lake, Duck Mountain: *Potamogeton praelongus*, *Nuphar variegatum*, *Ranunculus Purshii*, *Myriophyllum exalbescens*, *Hippuris vulgaris*, and *Utricularia vulgaris*.

Clay-gravel cobbly beach of Blue Lake, Duck Mountain: *Equisetum scirpoides*, *E. variegatum*, *Picea glauca* (2 feet in height), *Pinus Banksiana* (3 feet in height), *Deschampsia caespitosa* var. *glauca*, *Calamagrostis inexpansa* var. *brevior*, *Poa pratensis*, *Festuca saximontana*, *Phragmites communis* var. *Berlandieri*, *Schizachne purpurascens*, *Carex aurea*, *Juncus balticus* var. *littoralis*, *Sisyrinchium montanum*, *Habenaria viridis* var. *bracteata*, *Populus tremuloides* (small), *P. balsamifera* (small), *Salix lucida*, *S. Bebbiana*, *S. lutea*, *S. planifolia*, *S. interior*, *S. gracilis*, *S. rigida*, *Betula papyrifera* (small), *Arenaria dawsonensis*, *Cerastium arvense*, *Thalictrum venulosum*, *Aquilegia brevistyla*, *Arabis hirsuta* var. *pycnocarpa*, *Parnassia palustris* var. *neogaea*, *Potentilla anserina*, *P. norvegica*, *Fragaria* sp.,

Amelanchier alnifolia, *Astragalus alpinus*, *Oxytropis splendens*, *Polygala Senega*, *Viola adunca*, *Elaeagnus commutata*, *Shepherdia canadensis*, *Oenothera biennis*, *Zizia aptera*, *Arctostaphylos Uva-ursi*, *Agastache Foeniculum*, *Lonicera dioica* var. *glaucescens*, *Campanula rotundifolia*, *Solidago canadensis*, *S. graminifolia* var. *media*, *S. hispida* var. *lanata*, *Taraxacum officinale*, *Antennaria campestris*, *A. nitida*, *Senecio pauperculus*, *Cirsium arvense*, *Sonchus arvensis* var. *glabrescens*, and *Aster ciliolatus*.

VEGETATION OF THE BARALZON LAKE AREA

Baralzon Lake lies near the southern edge of the arctic tundra, which occupies an area in Manitoba north of a line extending from a point somewhat south of Churchill, northwestward to the sixtieth parallel at about the middle of the northern boundary of the province. The terrain is somewhat rolling, areas of typical, xerophytic, barren ground habitat (Plate XXV), with numerous frost polygons, alternating with wet muskeg areas in the depressions and around ponds. No outcrops of the underlying Precambrian bedrock occur in the area.

Less than one per cent of the area is wooded with scrub black spruce and larch of heights rarely over 15 or 20 feet, although there are indications that the wooded area was once somewhat more extensive (Plate XXVI).

The following lists indicate the vegetation of various habitats near the sixtieth parallel in Manitoba on the eastern side of the lake (98° 10' west longitude):

PLATE XXV



Barren ground habitat on the sixtieth parallel, east coast of Baralzon Lake.



Isolated stand of stunted black spruce and tamarack on the sixtieth parallel, east coast of Baralzon Lake.

Dry, rocky barrens and gravelly hillocks: *Picea mariana*, *Agrostis borealis*, *Poa glauca*, *Calamagrostis canadensis* var. *robusta*, *Deschampsia atropurpurea*, *Hierochloa alpina*, *Carex glacialis*, *C. deflexa*, *C. Bigelowii*, *C. capitata*, *C. Williamsii*, *Luzula multiflora*, *L. Wahlenbergii*, *L. confusa*, *Juncus albescens*, *Tofieldia pusilla*, *Betula glandulosa*, *Sagina intermedia*, *Empetrum nigrum*, *Epilobium angustifolium*, *Diapensia lapponica*, *Arctostaphylos alpina*, *Loiseleuria procumbens*, *Ledum decumbens*, *Vaccinium Vitis-Idaea* var. *minus*, and *V. uliginosum* var. *alpinum*. Of these, *Carex Williamsii*, *Juncus albescens*, and *Tofieldia pusilla* were especially characteristic of the stony, disturbed ground within frost polygons.

Hummocky sedge-heath tundra: *Equisetum sylvaticum* var. *pauciramosum*, *Lycopodium Selago* var. *appressum*, *L. annotinum* var. *pungens*, *Larix laricina*, *Carex Bigelowii*, *C. glacialis*, *C. rariflora*, *C. tenuiflora*, *C. canescens*, *C. saxatilis* var. *miliaris*, *C. chordorrhiza*, *C. stans*, *Eriophorum angustifolium*, *E. spissum*, *Scirpus cespitosus* var. *callosus*, *Juncus arcticus*, *Smilacina trifolia*, *Salix arctophila*, *S. planifolia*, *S. herbacea*, *Polygonum viviparum*, *Coptis groenlandica*, *Potentilla palustris*, *Rubus Chamaemorus*, *Ledum groenlandicum*, *Andromeda Polifolia*, *Chamaedaphne calyculata*, *Vaccinium uliginosum* var. *alpinum*, *Pedicularis labradorica*, and *Pinguicula villosa*.

Isoetes muricata and *Arctophila fulva* were collected in shallow water of the lake, and *Alnus crispa*, *Stellaria monantha*, and *Petasites palmatus* were collected along the shore. *Sparganium minimum* was found in a small pond near the lake.

VEGETATION OF THE NEJANILINI LAKE AREA

The Nejanilini Lake site lies about 45 miles south-southeast of the Baralzon Lake station, at north latitude $59^{\circ} 22'$, west longitude $97^{\circ} 46'$, 130 miles northwest of Churchill. A small band of Chipewyan Indians customarily makes its summer camp near the Hudson Bay Post located on the lake.

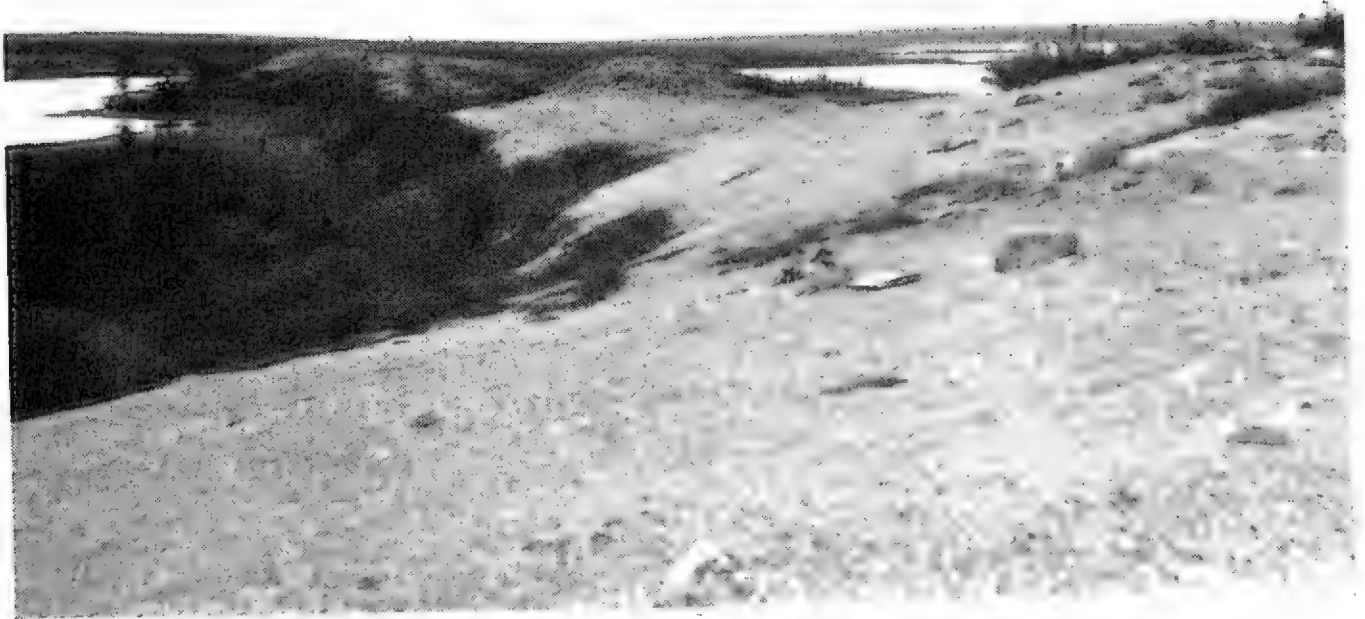
The black spruce muskeg forest is much more extensive here than around Baralzon Lake, occupying considerable portions of the terrain below the upland barren grounds (Plate XXVII). The following species are represented: *Picea mariana*, *Larix laricina*, *Carex rariflora*, *Eriophorum medium*, *Scirpus cespitosus* var. *callosus*, *Smilacina trifolia*, *Salix arctophila*, *Stellaria calycantha*, *Viola palustris*, *Epilobium palustre*, *Cornus canadensis*, *Chamaedaphne calyculata*, *Andromeda Polifolia*, and *Galium trifidum*. *Carex deflexa*, *C. Bigelowii*, and *Corydalis sempervirens* were present in dry, rocky openings in the forest.

The following species were collected on sand-gravel ridges and knolls in the area (Plates XXVII and XXVIII): *Lycopodium complanatum*, *L. annotinum* var. *pungens*, *Equisetum sylvaticum* var. *pauciramosum*, *Poa glauca*, *Calamagrostis canadensis* var. *scabra*, *C. canadensis* var. *robusta*, *Puccinellia Nuttalliana* (introduced), *Agrostis scabra*, *Hordeum jubatum* (introduced), *Carex deflexa*, *C. brunnescens*, *C. canescens*, *C. Bigelowii*, *C. capitata*, *C. saxatilis* var. *miliaris*, *Juncus filiformis*, *Luzula confusa*, *Betula papyrifera* var. *neoalaskana*, *Geocaulon lividum*, *Ribes glandulosum*, *Potentilla norvegica*, *Rubus Chamaemorus*, *Empetrum nigrum*, *Ledum groenlandicum*, *L. decumbens*, *Loiseleuria procumbens*, *Arctostaphylos alpina*, *Vaccinium uliginosum* var. *alpinum*, *V. Vitis-Idaea* var. *minus*, *Epilobium angustifolium*, and *E. angustifolium* f. *albiflorum*.

PLATE XXVII



Forest and barren ground vegetation at Nejanilini Lake.



Sand-gravel ridge, Nejanilini Lake.

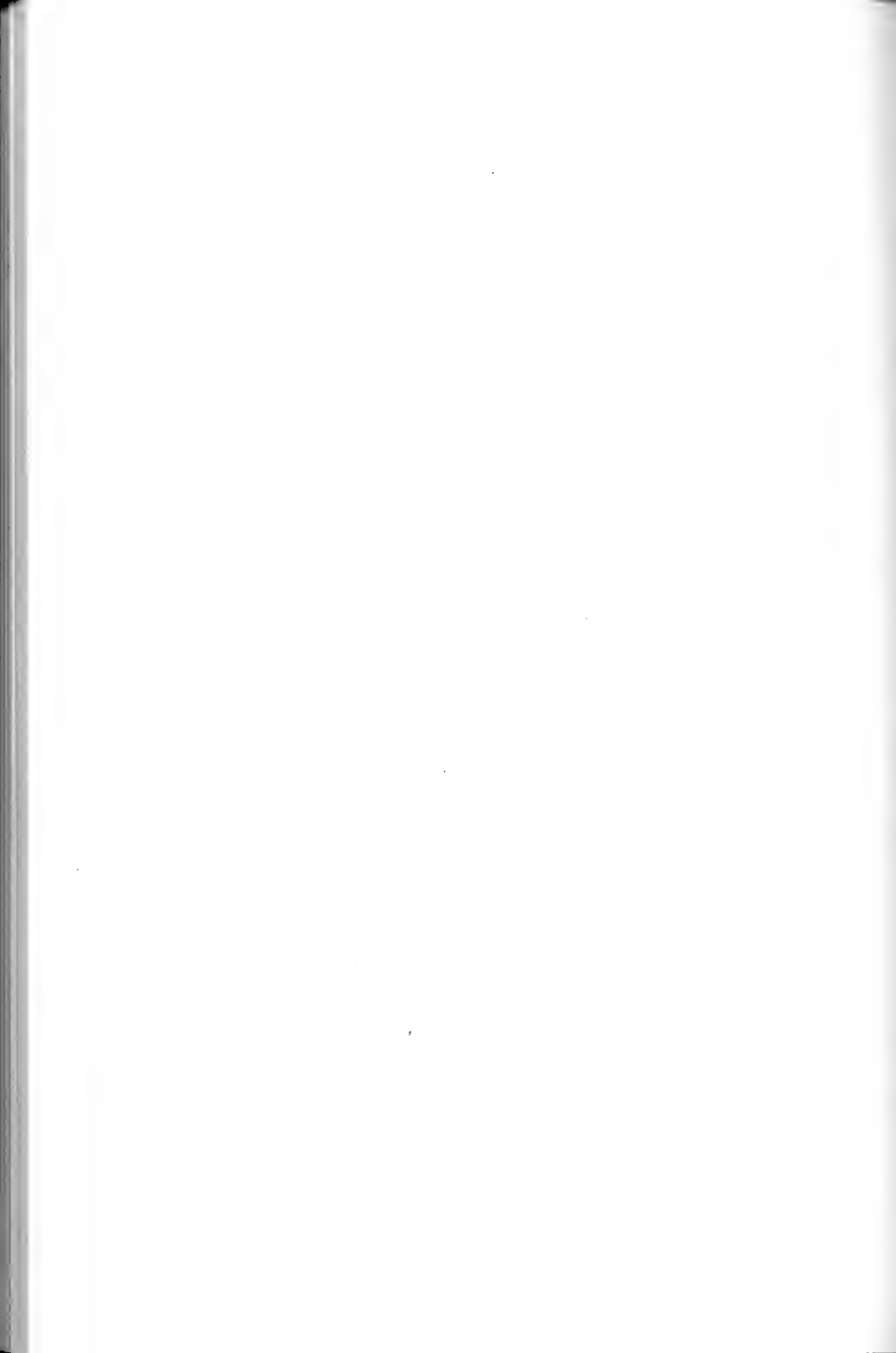
The following species grew near the edge of the lake: *Eriophorum spissum*, *Juncus filiformis*, *Salix planifolia*, *S. herbacea*, *Betula glandulosa*, *Ranunculus reptans*, and *Epilobium palustre*. Marshy ground below the barrens yielded the following: *Eriophorum angustifolium*, *Carex aquatilis*, *C. saxatilis* var. *miliaris*, *C. paupercula* var. *irrigua*, *Luzula parviflora*, *Polygonum viviparum*, *Potentilla palustris*, *Rubus acaulis*, *R. Chamaemorus*, *Oxycoccus microcarpus*, *Kalmia polifolia*, and *Pedicularis labradorica*.

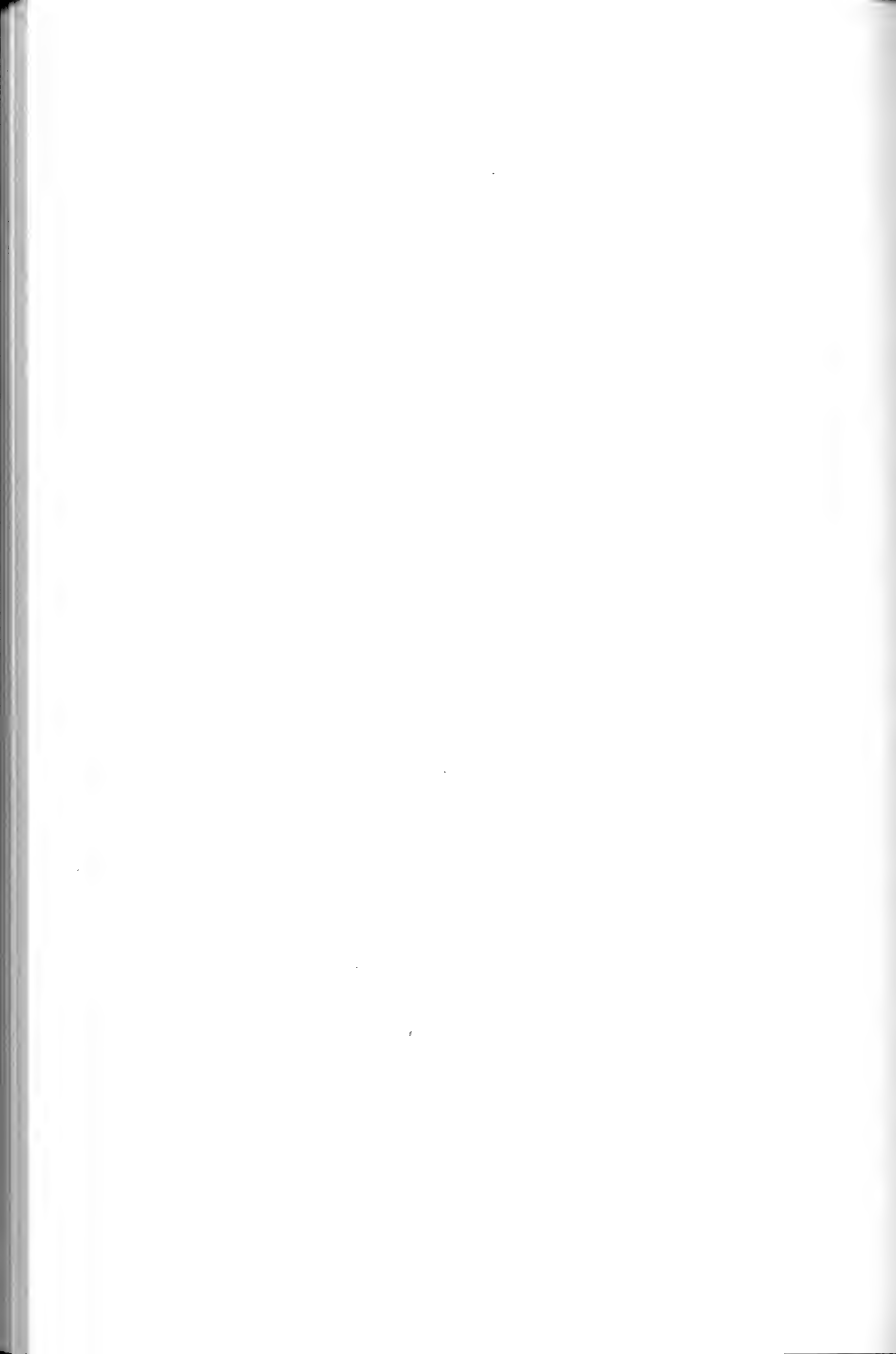
In contrast to the coastal area of Manitoba at and north of Churchill, the flora of the interior barrens at Baralzon and Nejanilini Lakes is relatively poor in number of species. Intensive search failed to disclose the presence of more than 83 species and 2 varieties of ferns and flowering plants (plants represented by a variety only, the type form being absent, are included in the figure for species). Extensive stands of conifer forest near Churchill have numerous species not to be expected in the barren ground vegetation. The collections and published reports of E. Beckett, R. Bell, G. Gardner, W. C. Gussow, F. Johansen, J. M. Macoun, N. Polunin, A. E. Porsild, E. A. Preble, N. W. Radforth, John Rae, John Richardson, and J. B. Tyrrell indicate a flora for the Churchill area of approximately 366 species and 41 varieties of vascular plants. Porsild (1950) reports that a collection made by Dr. Francis Harper in the forested area of southwestern Keewatin included 134 species and varieties. This collection was made on Nuelin Lake, west and slightly north of the Baralzon Lake station, but south of the limit of the typical barren grounds, an estimated 10 to 20 per cent of the land being forested by black spruce, tamarack, white spruce, white birch, and balsam poplar.

The position of Churchill at the mouth of a great river may also help to account for the greater richness of its flora. In addition, Churchill has a more humid climate, owing to the prevalence of fog during the summer. The airplane which was to transfer the writer's party from Baralzon Lake to Nejanilini Lake was storm-bound at Churchill for several days, although the weather during this period at Baralzon Lake was ideal. Rock outcrops are extensive around Churchill, whereas none was observed in the Baralzon-Nejanilini area. The numerous halophytic plants of the coastal strip are, of course, absent in the interior.

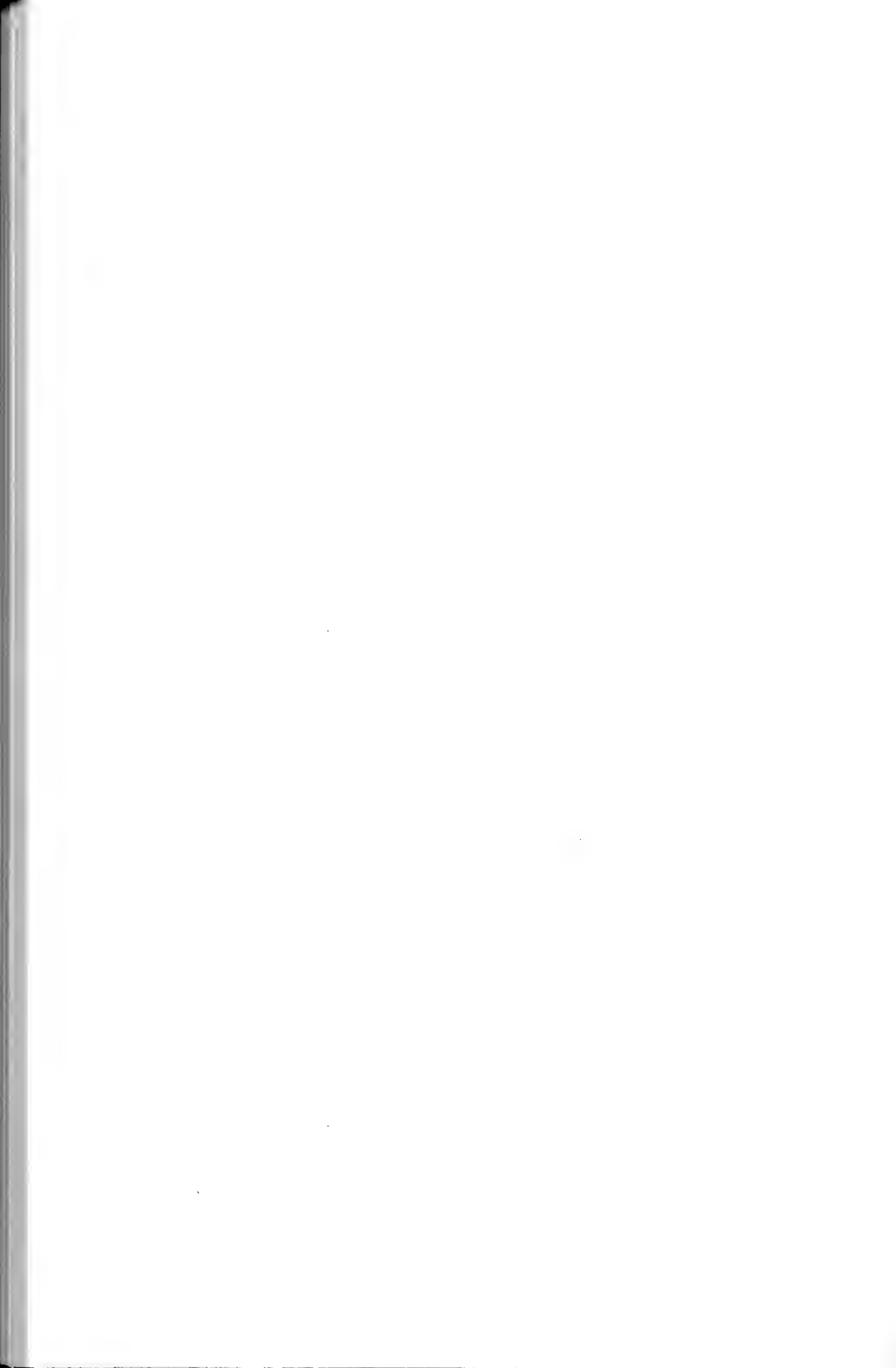
REFERENCES

- Bird, R. D. (1930): Biotic communities of the Aspen Parkland of Central Canada. *Ecology*, vol. 11, pp. 356-442.
- Clarke, S. E., J. A. Campbell, and J. B. Campbell (1942): An ecological and grazing capacity study of the native grass pastures in Southern Alberta, Saskatchewan, and Manitoba. Dept. Agric., Canada, Tech. Bull. 44, pp. 1-31.
- Connor, A. J. (1939): The climate of Manitoba. Economic Survey Board, Manitoba, pp. 1-163.
- Coupland, R. T. (1950): Ecology of mixed prairie in Canada. *Ecol. Monog.*, vol. 20, pp. 271-315.
- Ellis, J. H. (1938): The soils of Manitoba. Economic Survey Board, Manitoba, pp. 1-112.
- Ellis, J. H., and W. H. Shafer (1940): Reconnaissance soil survey, southwestern Manitoba. Manitoba Soil Survey, Soils Report No. 3, pp. 1-104.
- Halliday, W. E. D. (1935): Report on vegetation and site studies, Clear Lake, Riding Mountain National Park, Manitoba. Dept. of the Interior, Canada, Forest Service, Research Note 42, pp. 1-80 (plus 44 pages of appendices).
- (1937): A forest classification for Canada. Dept. Mines and Resources, Canada, Forest Service, Bull. 89, pp. 1-50.
- Harrison, J. D. B. (1934): The forests of Manitoba. Dept. of the Interior, Canada, Forest Service, Bull. 85, pp. 1-80.
- Porsild, A. E. (1950): Vascular plants of Nueltin Lake, Northwest Territories. National Museum, Canada, Bull. 118, pp. 72-83.
- Sampson, H. C. (1921): An ecological survey of the prairie vegetation of Illinois. Ill. State Lab. Nat. Hist., vol. 13, pp. 523-577.
- Shimek, B. (1911): The prairies. Iowa State Univ., Lab. Nat. Hist., Bull. 6, pp. 169-240.
- Stevenson, H. I. (1938): The forests of Manitoba. Economic Survey Board, Manitoba, pp. 1-190.
- Thornthwaite, C. W. (1931): The climates of North America according to a new classification. *Geogr. Rev.*, vol. 21, pp. 633-655.

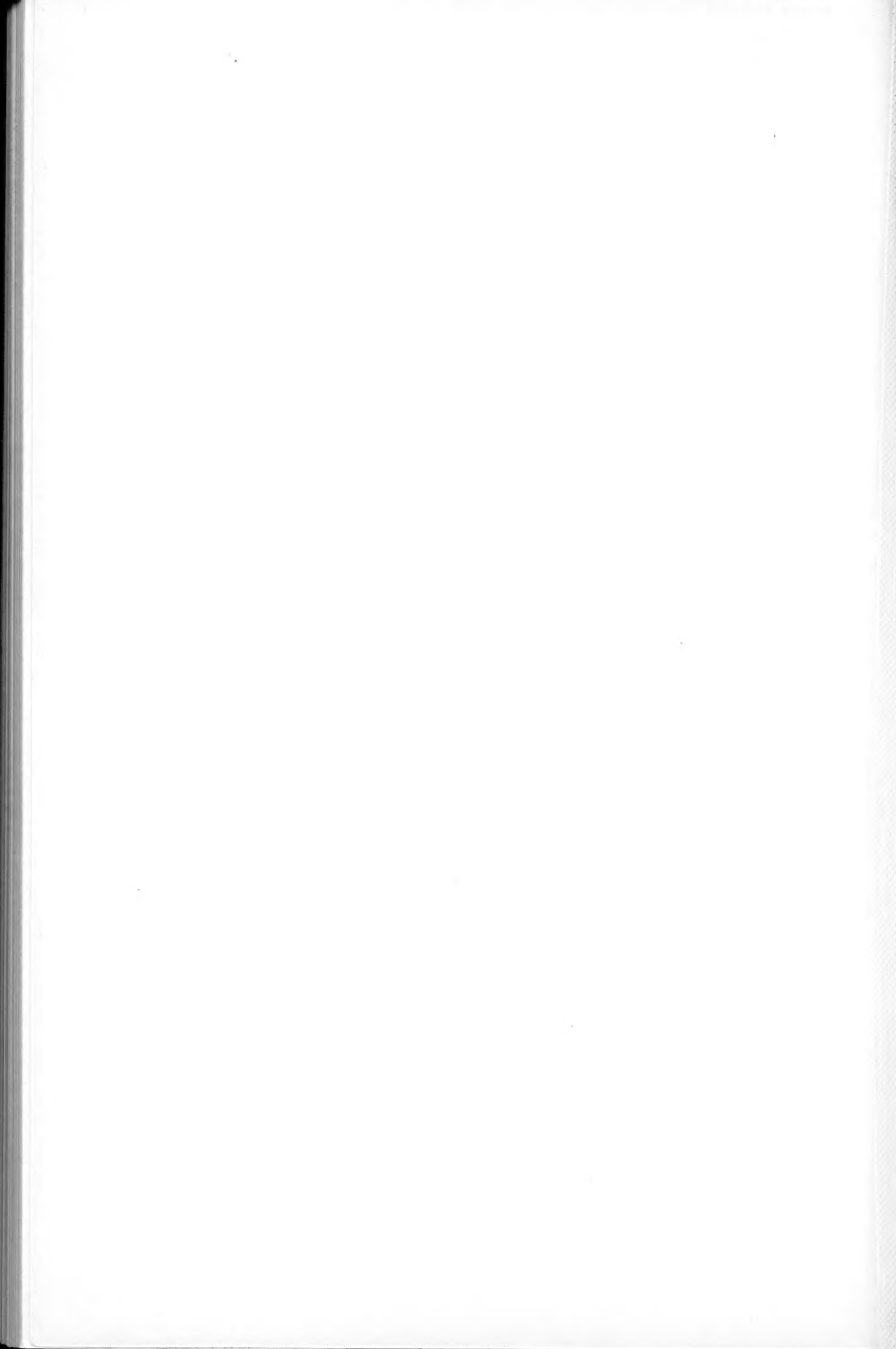


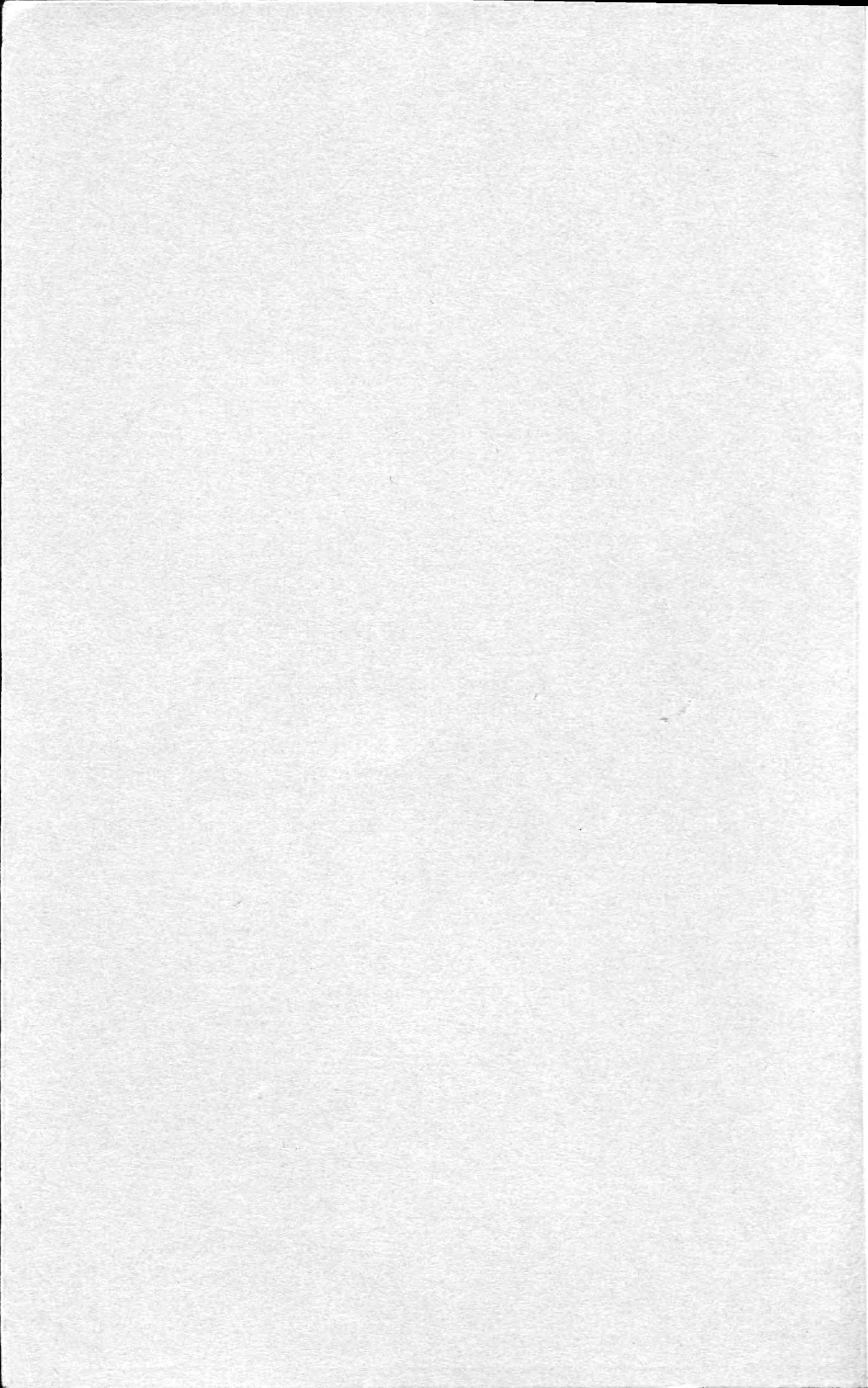












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QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
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